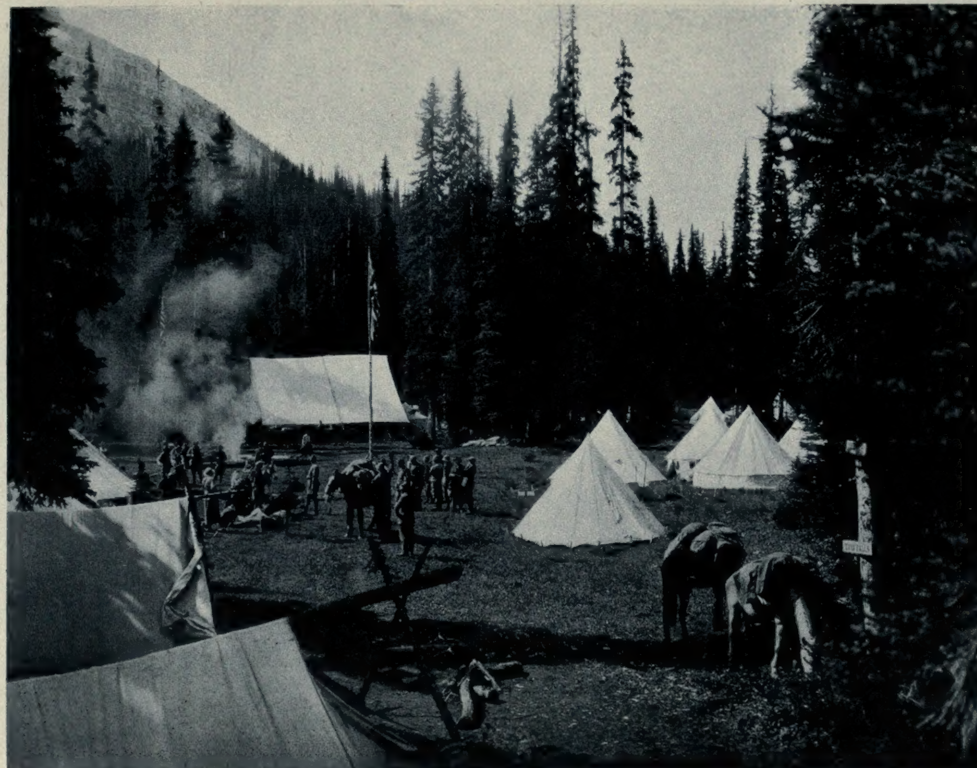

Photo, H. Pollard

THE VICTORY CAMP AT YOHO PASS, 1919

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CANADIAN ALPINE JOURNAL

VOL. XI. PUBLISHED BY THE ALPINE CLUB OF CANADA

MOUNTAINEERING SECTION

AMATEUR CLIMBING

BY W. E. STONE

Mountain climbing differs from most other sports in that it is usually enjoyed under the leadership of professional guides. Aside from these guides, the devotees of mountaineering are strictly amateurs, risking their necks and undertaking difficult and dangerous ascents for the sheer pleasure of the adventure. In what this pleasure consists it is not the purpose of this article to set forth; it need not be described to the initiated, and to others the attempt would be useless. Probably each individual derives his own peculiar satisfaction from a mountain climb; but whatever the experience may be, its pursuit becomes an obsession on the part of an ever-increasing number of lovers of outdoor life, while its benefits so overwhelmingly exceed its casualties, that it need trouble no man's conscience to encourage the sport.

When one takes up mountain climbing to any extent he becomes speedily impressed with his own limitations, and fortunate is he who never achieves that degree of self-confidence in which he forgets that human experience or skill never transcends nature's inexorable laws. The *sine qua non* of mountaineering is to recognize one's

limitations, and because the beginner has no means of knowing what these are, he must make use of the knowledge of another, namely, the professional guide.

It is a wise rule of the A.C.C. which provides that camp members shall not undertake expeditions without approval as to the mountaineering skill of the leader. Even a person of long experience in ordinary out-door sports may not presume upon this in the mountains, for alpine conditions include a thousand dangers which do not exist in the lowlands, ignorance of which has resulted in many a distressing accident. The services of an experienced guide are absolutely necessary at the beginning of any climber's career. After this the aptitude with which one learns to understand alpine conditions and to recognize their dangers depends naturally upon his previous experience, good sense and love for the sport. But sooner or later anyone who persistently engages in mountain climbing with guides comes to a point where he longs to test his ability to climb independently. Such a desire is in the highest degree commendable and should be encouraged rather than repressed. While the Alpine Club must as a matter of course introduce novices to the mountains, one of its important functions is to train and develop members capable of acting on their own initiative and in some degree to become independent of the professional guides. Every one with the love of the mountains in his heart should strive for the ability to climb independently. How often has one chafed at the delays incident upon waiting until guides were available and asked himself if it were not possible to make the ascent unaided. How often under such circumstances is one restrained by fear of the unknown or of imaginary difficulties which would disappear if met with confidence and caution. With the increase of climbing the services of guides are more and more difficult to obtain and our would-be mountaineers must act for themselves or be contented with the worn

MT. MARPOLE FROM THE NORTH

MT. PINNACLE FROM EIFFEL PK.
Showing Routes of Ascent

Photos, W. E. Stone

THE SWISS PEAKS AND HERMIT MT.
From the South

trails and easy elevations. As matters are now few can expect to reach the higher peaks unless able to be their own guides.

I count it highly desirable, from every standpoint, for those who wish to enjoy the mountains, to cultivate independence of movement and to take advantage of every opportunity to increase their mountaineering knowledge. Too often, when in charge of a guide, climbers follow blindly, noting neither the route nor the surroundings. If deprived of the guide by some accident such climbers would be unable to retrace their route, to negotiate a difficult descent over rocks or snow slopes, or across a crevassed glacier. Yet such a contingency is always possible, and in many cases would have serious consequences.

Climbing with a guide should always embrace the element of training, of learning the reasons for his movements and decisions; so that after an ascent one may not only felicitate himself upon an interesting experience but equally upon having gained knowledge in the art of mountaineering. I never look upon a mountain without instinctively studying a possible route of ascent, and when climbing with guides endeavor to learn the reasons for their movements. Only in such a manner, by taking the initiative, by observation and inquiry, can one train himself in the countless details which bear upon successful climbing.

But, after all, experience is the best teacher and especially in mountaineering, where the price of not knowing one's lesson is so costly, experience becomes indispensable. As rapidly as the amateur can trust his powers, he should put them to the test. At the annual camps of the Alpine Club there are trails, expeditions and climbs to which members of varying qualifications may be entrusted if they show enough initiative to undertake them. Every such endeavor establishes confidence, furnishes valuable experience and advances the amateur

towards independent standing. The first unaided ascent of a respectable peak is the crowning experience of the amateur mountain climber. In after years he may accomplish really great feats but none of these will mean more to him than his first achievement.

Independent action in the exploration of valleys. routes and passes, excursions up the slopes of high mountains, then to the top of a lesser peak, and finally an attempt on a real mountain, are all progressive steps in development which any strong and self reliant man may undertake as cumulative experiences in mountaineering. There are innumerable climbs and excursions in the regions occupied by the various club camps capable of affording the greatest pleasure and good training to our amateurs. A little more initiative on their part would greatly extend their enjoyment as well as emphasize a function of the club in producing climbers and mountaineers.

In every camp of the club there are certain persons who require the services of the professional guides; some for the graduating climb and others for ascents of more than ordinary difficulty. Another class are sufficiently experienced to make up small parties for first class climbs under the leadership of one of their own number. Such amateur climbing furnishes the highest enjoyment and extends the achievements of club members. By following out such a programme there would be developed an increasing number of good climbers and experienced leaders in the club ranks, and after a time it would be possible for most of the climbing done from the club camps to be led by its own members. As the writer recalls, the graduating climbs from most of the club camps have been of a kind to be safely entrusted to the leadership of its experienced members. For instance, Ptarmigan, Storm, Aberdeen, Vice-President and Cathedral mountains, the more notable graduating climbs of the club, require for their ascent no more skill than can

be supplied by a number of our active members. With small parties of experienced climbers, mountains in a more difficult class than above mentioned may be climbed with amateur leaders, and, indeed, at one time or another many of the first class climbs in the Canadian Rockies and the Selkirks have been made without the aid of professional guides. In 1919 alone amateur ascents were made of Edith, Vice-President, Temple, Pinnacle, Eiffel, Marpole, Habel, Wapta (north face), Rogers, Swiss Peaks, Hermit and Tupper, while, as exceptional achievements, Mr. and Mrs. MacCarthy, without guides, climbed Lefroy by the north arête and Sir Donald by the northwest arête, in both cases descending by the same route. Some of the most difficult ascents, such as Hungabee and Victoria, have been made by amateurs, and finally the notable record of Palmer, Holway and Butters in exploring and conquering the virgin peaks of the Selkirks prove that we have American mountaineers capable of following the examples of the distinguished climbers of Europe. For the development of amateur mountaineering in America the field of effort and the men of ability are not lacking. What is needed is a realization among our young men of the possibilities and the initiative to grasp them.

As I have written these lines, the thought has been continually haunting me that while it is pleasant to point out the high peaks and to speak of the rare sport to be found among them, one is never certain of the effect of his words upon his readers. Some may profit by a spur to their endeavour, but others, over confident and ambitious, may be led to undertakings beyond their powers. One should be cautious in giving advice on this subject. Says Claud Schuster, in "Peaks and Pleasant Pastures," "The rules are known and those who break them and by precept and example tempt to break them those whom they should teach, wrong the sport which they profess to love." However, my plea is not for rash

endeavours but for training and experience for the amateur, going from step to step to greater undertakings. It is not to be expected that dangers can be eliminated, otherwise mountaineering would have little attraction. It is a good lesson for the amateur to meet difficulties and even defeat. "There is an educative and purifying power in danger that is to be found in no other school," says Mummery, one of the greatest of amateur climbers. And again, "Equally, whether he succeeds or fails, he delights in the fun and jollity of the struggle."

It is said that one is not fully initiated as a mountaineer until he has spent a night high up among the rocks. To feel a hold upon which one has thrown his weight, yielding; to suddenly find his legs projecting through a snow bridge into a crevasse; to be caught in a storm and freezing on some steep slope; to hear the whistle of an unseen missile from the cliffs above, are dangers and experiences which threaten but also school the amateur in self-reliance and caution. One who, having reasonable experience and training, hesitates because of doubts and fears may not hope to become a mountaineer.

No word of mine should be taken as reflecting in the remotest way upon the services or the importance of the Swiss guides who have been such a great factor in Canadian mountaineering. The names of Feuz, Aemmer, Häsler, Kaufmann and others in the employ of the C.P.R., together with that of Conraid Kain, are imperishably connected with the history of our mountains. They have established the methods and standards of Swiss mountaineering in this country and such amateur achievements as may be accomplished by members of the Alpine Club will be based upon the teaching of these admirable men. No amateur, however brilliant, can dispense wholly with the services of the professional guide. There comes a time when he trusts himself to others more experienced than himself and the history of

Photos, W. E. Stone

MT. EDITH FROM N.W.

MT. WAPTA FROM YOHO LAKE

MT. TUPPER FROM THE MAIN RIDGE

mountaineering is full of instances where this trust has been heroically fulfilled. "The experience gained by the climber as he watches year by year the methods and practices of these masters of the craft cannot fail to be in the highest degree instructive," says Farrar. No possible development of amateur climbers can ever eliminate the necessity for the professional guide from whom the beginners must always learn and to whom the skilled amateur must turn in his supreme undertakings.

It may seem presumptuous to lay down any rules for the guidance of amateur climbers. It is inconceivable that one should undertake serious climbing until experience under a competent guide has introduced him to at least the ordinary sources of danger, and after this he will have little need of conventional advice, although certain precautions are always fundamental.

Solitary climbing is, I believe, quite unwise even for the most skilful, for there is always the possibility of mishap, the consequences of which would be greatly increased to one alone in an unfrequented place. Except on easy ground more than three persons in a party has its drawbacks, but less than three is unadvisable, and on snow or glaciers is inadmissible. An amateur party ought not to include in any serious ascent a person inexperienced in that particular kind of climbing. The severest test of an amateur's qualifications is found on ice and snow, and this should be the last to be attempted by him, for be it remembered that even the professional guides find these conditions the most difficult to judge. It follows as a matter of course that the amateur should be familiar with the climber's tools, the ice-axe and rope.

Finally, there is a gospel of the mountains to be preached to the amateur climber as well as to those who have not yet learned to lift up their eyes to the hills. The vast mountain ranges are storehouses of health and inspiration to the human race. There is no possibility of their ever being cheapened or of losing their charm,

though thousands look upon them and many feet tread their summits. It is the duty of those who have learned in some slight degree to appreciate their wonders to help others to a like enjoyment. One choice soul, now ascended to empyrean heights, painstakingly and sympathetically introduced the writer to mountaineering pleasures and my debt to him can be repaid only as I, in the same spirit, seek to turn the feet and thoughts of others to the mountains.

But no one can learn to know the mountains except in the freedom which is acquired by the amateur climber, who, in his own mood and at his own choice time, scales the great heights. His reward can be estimated only by one who has learned at first hand the secrets and the grandeur of the mountains, who has felt the joy of battle with crags and ice. Such a lover of mountains and the prince of amateur mountaineers, who slept at last among the lonely hills, speaks thus of the rewards of the climbers: "He gains a knowledge of himself, a love of all that is most beautiful in nature, and an outlet such as no other sport affords for the stirring energies of youth; gains for which no price is, perhaps, too high. It is true the great ridges sometimes demand their sacrifice, but the mountaineer would hardly forego his worship though he knew himself to be the destined victim. But happily to most of us the great brown slabs bending over into immeasurable space, the lines and curves of the wind-moulded cornice, the delicate undulations of the fissured snow, are old and trusted friends, ever luring us to health and fun and laughter, and enabling us to bid a sturdy defiance to all the ills that time and life oppose."*

***Mummery.**

A MOUNTAINEERING TRIP TO THE BRITISH AND FRENCH MILITARY AND ASSINIBOINE GROUPS 1919

By J. W. A. Hickson

When again, last summer, an opportunity presented itself of another visit to the Rockies, with a probability of a friend joining me for a month, my thoughts turned at first to the district of the Saskatchewan River of which I had had only a glimpse in the unfavourable summer of 1913, when our expectation of climbing Mt. Forbes and neighbouring peaks had to be abandoned owing to persistently stormy weather. I had not then, and have not yet given up the hope of getting to that region again. On consulting, however, with my well-tried climbing companion, Edward Feuz, he wrote recommending an expedition which he had suggested a couple of years before, and which now was much more feasible than it was then on account of the work done by the Interprovincial Boundary Commission, to the group of mountains southeast of Banff and south of the Palliser Pass, recently designated the Royal Group, a range of eight peaks varying in height from a little under 10,000 feet to 11,226 feet (Mt. King George). After various weighings of pros. and cons. Feuz's plan carried the day and, accordingly, after my arrival at Lake Louise about the middle of July, negotiations were entered into with Mr. Crosby of Brewster Brothers at Banff which culminated in arrangements being made to start out from the last mentioned place on the eighth of August; as we did. In the meantime, some old scenes and climbs were re-visited around Lake Louise and Moraine Lake, and several interesting and exhilarating days were spent at the annual camp meeting of the A.C.C. in the Yoho,

where one's muscles were strengthened by exercise on Mt. Marpole.

On returning to Lake Louise on August 4th, where I was joined by my friend Mr. A. C. Stead of Montreal, and where I had the pleasure of renewing acquaintance with certain American lovers and explorers of the mountains, among others Mr. W. D. Wilcox and Major R. H. Chapman, Secretary of the A.A.C. whose recent death is greatly deplored, and later Mr. Howard Palmer, I heard from Feuz that the well-known visitors of the Rockies, Messrs. Fynn and Eddy, had, with the Swiss guide, Aemmer, set out a couple of days previously for Banff, whence they proposed making an expedition to Mt. Assiniboine and certain peaks south thereof. Such was the current report; but from other less definite data it seemed to us that the party might be bound for the same objective as ourselves; and, since we could not get away for several days, it suggested itself as the course of practical wisdom to examine the maps again very carefully to discover whether, in the event of our surmise being correct, there would be anything of interest in the mountaineering line for us to do in the district we planned to visit. We decided there was, and if we were forestalled by earlier visitors to the Royal Group, there might be a couple of interesting climbs in the British Military peaks; at least one in the more distant French Group; and that we could return by way of Mt. Assiniboine, of which mountain, climbed with the late A. F. Wedgwood in 1910 by the western and north arête in extremely unfavourable conditions, I was desirous of making a complete traverse.

Everyone who has had experience of making a start from a centre of equipment in Western Canada, knows how chimerical is the hope of setting out anywhere near the time arranged on beforehand. If you start on the same day that you have planned, you are not unlucky. Enjoined to be at the Brewster stables at good time in

the morning, and stimulated by the impatient Feuz, we were on hand by nine o'clock and waited around for some five hours before there were signs that the pack train was really under way. In the meantime there was much telephoning, driving and riding to and fro over the face of Banff, accompanied by the usual mountain lingo which is always emphatic, if not refined. As things turned out, it was worth while waiting; for tents, equipment and horses were excellent, the food was splendid and plentiful, and it is no exaggeration to say that on none of the many expeditions I have made in the mountains were our general comforts ministered to with more intelligence and success. We were a party of five men, each with a saddle horse, and had six pack horses; one of our attendants who was to have been the cook, was a disappointment, but of the head trail man, Mishico, it is difficult to speak too highly; his capacity and versatility covering up and helping out any deficiencies of his assistant. His good nature and untiring energy were a great asset to the party.

Of the trail and its incidents little need be said before we reached our camp near Palliser Pass. For six miles after leaving Banff the trail is like a carriage road. A slight mishap to one of the pack horses could, in the light of after events, be interpreted only as a fortunate omen, although it occasioned considerable delay and inactivity with restive horses in the midst of heat and active flies. The nights were quite frosty; the fishing *en route* good. We camped the first night at one of the R.M.P. Huts (Whiteman's), directly south of Canmore and of the pass leading therefrom and thereto and under the shadow of one of the Three Sisters; the second night was spent in a barren open space south of the second Spray Lake; and the third afternoon, rather late, saw us after a hard and longer day over a rougher trail, encamped about a mile north of Palliser Pass and several hundred feet below its summit in very snug

quarters on the right or west side of the valley with full view of Mt. Sir Douglas (Haig) 11,176 feet, the highest of the British Military Peaks which dominates the pass on the northeast. Here our surmise respecting the intention of the Fynn-Eddy party was confirmed as the result of a tour which the energetic Mishico made to the top of the pass in the evening, where he found their tents and all the party, except Mr. Fynn and Aemmer who were away (as it turned out on a trip to Mt. King George). In the meantime I went to bed and did not hear the interesting news until the following morning when Feuz came to our tent to arouse us with it.

It was 8.30 o'clock by the time we had breakfasted, and Feuz was anxious to know what we were to do, whether attempt Mt. Sir Douglas or push on further without delay. Since I was convinced that the former had not been climbed and it certainly looked worth trying, I decided that we should make a start for it immediately; although to do so after nine a.m. was opposed to all our previous practice and to a sound theory of early starts. The weather, however, was glorious; the days were still long, the peak not very far off, although the approach to it over burnt timber was rough; and I felt that even if we did not make the top, we should perhaps discover the best route or, at least, a route which could be tried on the following day. Getting on our climbing gear and putting the few edibles and other necessaries into our rucksacks as quickly as possible, we left camp about 9.15 o'clock and made straight across the valley to the west. Mr. Stead accompanied us, but only to the foot of the upper glacier of Sir Douglas, whence he returned to camp, not being in proper condition for a stiff climb.

On the northwest side of the peak, two almost parallel glaciers descend to about 7,500 feet and 7,000 feet, respectively. Notwithstanding the excellent view which our powerful and trusty field-glasses permitted of the

mountain, we could not decide which of these glaciers it would be the more advisable to ascend. The higher one seemed to offer the more direct route to the upper rocks, but would, it appeared, thereafter entail a long ascent through a couloir which might be dangerous by reason of ice and fallen stones. The lower glacier appeared to lead out on the west side to a very steep and smooth arête which looked scarcely practicable from below. We could not see then what we found later in the day, another arête close behind this, which was more feasible and was followed.

On reaching the tongue of the upper glacier, which ends in the steep icefall indicated by the picture, we decided, and very wisely as events showed, inasmuch as the disadvantages of this route were obvious, to explore the lower one. It was a simple matter to step on to this glacier and ascend it for half an hour. Then we found conditions change very surprisingly. Our advance became much slower and more difficult. The rope was put on and step cutting began and continued for a long time, the snow being very hard and rapidly becoming steeper. Higher up, we were for a short time on bare ice, on which, bearing to the right, we struck lines of crevasses between and over which our course was rather sinuous. After two hours steady going we neared the top of the glacier presenting a steep ice slope of about sixty degrees with bergschrund close to the cliffs connecting with the western arête. Large steps cut by Feuz in the flinty ice made one feel fairly safe on the traverse of the slope to the left which was necessary in order to reach the rock wall. It is at such places that too great care cannot be displayed, for a bad slip on the part of one of the party may entail the destruction of all. Of course, only one man here moved at a time, and the other made himself as secure as possible by using handholds in the chilling wall during the movement of the other.

From the ice we stepped on to easy rocks, and in a few minutes were seated in a well protected hollow of the western ridge from which at this point an enormously steep and long couloir runs down on the south. This couloir seemed to offer the only possible route of ascent of the peak from that side, but looked to us, seeing it from above, as hardly practicable. The hour now being already 2.20 p.m., was too late to permit of much repose, since we calculated that we had at least a couple of hours' work ahead of us before we could (if we did) reach the summit. From where we were the way up, although steep, presented a less forbidding appearance than it did from below. After some slight refreshment, and having changed our nailed boots for rope-soled shoes (and making the mistake of leaving the former behind) we began the ascent of the final western ridge.

Some very steep pinnacles which seemed to bar the way were carefully circumvented, and at one of the last we left our ice-axes. In general the rock was more shaly and rotten than it looked, but where it was firm we were able to make good time. For the first half hour the ridge was closely followed, then came a short traverse to the right, and the ascent of a big couloir which led into and up the west face of the peak. No serious difficulties were met with but, where the rocks were especially steep, only one man moved at a time. From the top of the couloir a traverse was made to the left and a short couloir ascended which led out on to loose rocks not far below the first summit. This was reached at 4.30 and from it we saw the real summit a hundred feet higher (not visible from our camp below) further to the east, bare of everything in the shape of human workmanship, and separated from the point we were at by a very sharp and sensational-looking ridge. It was more spectacular than difficult, and we lost no time in crossing it. It is remarkable how after a few days exercise in higher

Photo, A. O. Wheeler

MT. SIR DOUGLAS FROM THE N. W.
Showing the Two Glaciers, and Route of Ascent of the Lower One

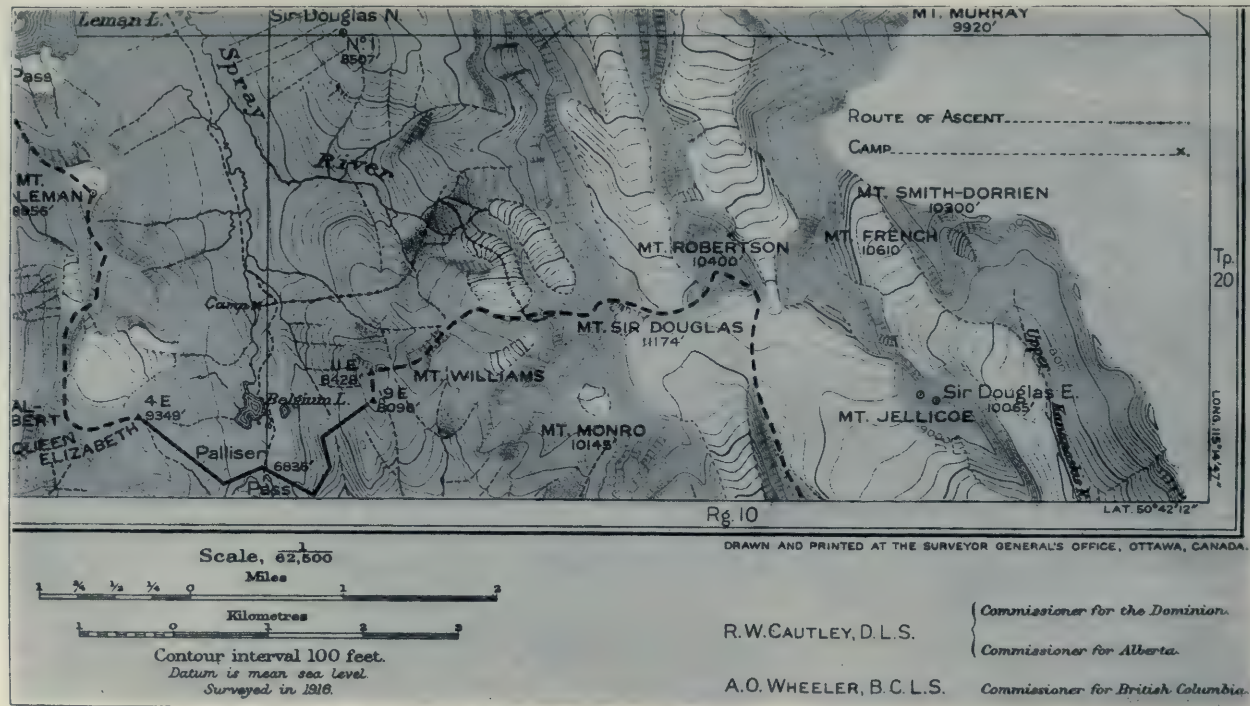
atmospheres, one's head becomes quite accustomed to these places. A cairn was built and we were back on the lower summit (where a small cairn was also erected) and ready to leave it at 5.15 p.m. We had little time to enjoy the splendid views of the Royal and Assiniboine Groups to the south and west, or to make out the Laggan peaks with the exception of Hungabee on this the clearest of all the days which we had on the trip. Throughout the ascent and more particularly on the latter part of it, Feuz had kept vividly before my mind the possibility of Sir Douglas having been already climbed and now replaced this exploded hypothesis by the disturbing suggestion that we might be benighted on our return.

On the descent, which was tedious, we followed very closely the route by which we had come up. The foot-holds were for the most part poor; and loose and sharp rocks worked havoc with our foot-gear, through which bare toes later protruded. Reaching again the rock wall immediately above the glacier, at 6.40 p.m., we lost no time in changing to our nailed boots, refreshing ourselves with liquids and solids, and gathering up our things, so that a few minutes after seven o'clock saw us again on the ice. I did not look forward with pleasure to the descent over the first part of this, but it was worse in anticipation than reality; for the big steps were of great assistance both moral and physical. Soon we were over the dangerous bit of it, and finding the lower snow softer than in the morning, we were able to make a quick descent to the foot of the glacier, reaching it shortly after eight p.m. Thence the moraine was followed on the right to some upper grass through which we descended over a series of ledges to the stream; crossing which we bore to the left and reached again the lower burnt timber. The last part of the route was extremely tiresome and fatiguing after a strenuous day, and notwithstanding the satisfaction of a first ascent, so unexpectedly accom-

plished, the amateur required a few cups of tea and some good food at the camp fire to make him feel perfectly happy. There had been ample daylight for our expedition, which had covered almost exactly twelve hours.

On the afternoon of the following day, August 12th, which was very warm and bright, we all strolled up to the summit of the pass where we had the pleasure of meeting Mr. and Mrs. Eddy and Mrs. Fynn, who had been climbing in the neighbourhood and who, on our arrival, were scanning Sir Douglas with their glasses, to catch a glimpse, if possible, of Mr. Fynn and Aemmer who had returned the day before from the conquest of Mt. King George and had started out that morning to climb the monarch of the British Military Group. We could see nothing of them, and, from the route which we were informed they had taken, neither Feuz nor I considered their chances of success to be very strong; but we were not actually confirmed in our opinion until after our return to Lake Louise. Next morning there was a momentary meeting on the Pass of both parties, comprising some dozen persons and twenty-five horses, the Fynn-Eddy party travelling northward on their way to Assiniboine, we crossing the charming pass southward-bound with the intention of seeing more of the British Group and getting into closer spatial relations with Mt. Joffre, the highest peak of the French Group.

The descent on the south side of Palliser Pass (6,836 feet) is exceedingly steep and the trail was in atrocious condition. To make a mile an hour here was not bad going. Fallen logs were a great impediment, and many burnt trees were waiting to fall, and some did actually come down with the boisterous wind which kept up most of the day. This was the worst and only really bad day on the whole trip, and we were well wet before reaching the floor of the main valley where we turned to the left and went up by a stream, Le Roy Creek, which runs down



MAP SHOWING MT. SIR DOUGLAS
And Route of Ascent

Taken from Interprovincial Boundary Atlas, Sheet No. 11

the valley leading from the North Kananaskis Pass. Up here the travelling was still worse, there being no trail whatever. Soaked and rather disgruntled, with the exception of Mishico, we made camp about five o'clock under the west side of Mt. Beatty and in full view of the Royal Group, as it disclosed itself next day, for the range was mostly at this time in mist and cloud. This was one of the least comfortable of any of our camping grounds, and one of the few at which our slumbers were disturbed by a porcupine.

Next morning, after a late breakfast, Mr. Stead, Feuz and I set out for the ridge, which we did not then recognize to be that of Mt. Beatty, immediately east of the camp, and after three hours easy climbing gained it at about 9,000 feet. The day was very cool with a strong wind, and great masses of cloud were moving around. *En route* we had excellent views of Mt. Sir Douglas and the associated peaks and of the Royal Group, and from the summit, which we reached by following the north ridge that provided some interesting bits of work making the use of the rope advisable, we clearly saw and could locate the approach to the elephantine and snow-clad Mt. Joffre, which was to be our next mountaineering objective. We were again on the march on the 15th August up the steep trail to the Kananaskis Pass, 7,700 feet, a most entrancing and unique spot framed between light green cliffs on the left, the tongue of Mt. Beatty Glacier on the right and containing in its centre an oval shaped lake with the clearest blue water, Lake Maude. We could revel in the scene only for half an hour. Owing to several miscalculations on our part, and unexpected behaviour on the part of nature, we were obliged to push on to the second or more northerly Kananaskis Lake before we could find a suitable camping ground—and although this was a very delightful one for a longer stay (altitude 5,390 feet), it was not reached

until after 9 p.m., with all the party in a very tired and hungry condition.

Notwithstanding Feuz's stimulating remarks and predictions that the fine weather would not hold much longer, I refused to do anything next day except loaf about, bathe in the lake, against his advice, and indulge mildly in a little fishing. But on the 17th, feeling more energetic, he, Mishico and the writer left camp in the morning on horses, taking with us two pack horses to carry a couple of small tents, sleeping bags and several days provisions for a quick visit to the French Military Group. We retraced the trail around the lakes and up the Kananaskis for one and a half hours, and then turning almost at a right angle to the left, made our way through the trail-less wood up a valley whence flows Foch Creek to join the Kananaskis River. The ground here was very uneven; tree-chopping had soon to be undertaken and the going was bad and advance very slow.

At about three o'clock we came in sight of a fairly large lake, well named Hidden Lake by the Boundary Commissioners, and decided an hour later, although a long way from our objective, Mt. Joffre, to camp at its near end, owing to the great difficulty in taking the horses further up the valley. Our two small tents were pitched on very poor ground about 200 feet above the level of the lake, the water in which was so high as to be well up among the spruce and not easy of approach. At the far end of the lake, a tremendous amount of "melt" was being poured in over the falls which we could both plainly see and hear. Immediately above us on the southwest lay Mt. Lyautey, almost 10,000 feet. Since we were still a little uncertain as to the exact position of Mt. Joffre, Feuz, after supper, quietly strolled up a knoll behind the camp, whence he indicated by unmistakable sounds that we were in the right direction. In fact he saw the top of Joffre directly to the south and hardly less than six miles distant.

Advancing the clock an hour in the interests of daylight saving does not help you much in making an early morning start in the mountains. It rather cuts you out of an hour's rest. Rising at 3.30 a.m. because we realised that there was a long day's work ahead of us and that we were completely ignorant of the ground over which we had to travel, we waited until nearly five o'clock for daylight and eventually started without its aid. There was still some moonlight and, for half an hour additional light was supplied by a lantern. Proceeding through heavy timber, alders and scrub, we gained the slopes some five hundred feet above the camp along the sides of which we continued up and down, but mostly up, for nearly a couple of hours, keeping all the time in a southerly direction; toilsome labour and strainful on the lower part of the legs. At seven o'clock the sun presented a somewhat watery appearance and Feuz, who held there had been too much delay, expressed grave doubts of the weather holding for our climb. Fortunately an hour later all ground for doubt was removed; bright sunshine prevailed all day and the only drawback was a thick haze, which foiled our efforts at photography.

After almost three hours steady going, during which we had advanced to tree line, we came out on open slopes and delightful meadow ground whence we could clearly see across the valley, through which flows Aster Creek in several rivulets, the huge glacier (coming close down to the lake of the same name) over which lay the latter part of our route, as we had all along rightly supposed. This, the Mangin Glacier connects immediately with the massif of Joffre and might well have been named Joffre Glacier. We made for it directly by a game trail which brought us to the Creek in the crossing of which we got our feet thoroughly wet. At 8.45 o'clock we were on the huge field of ice, and fifteen minutes later made our first stop for solid refreshment.

Being in good condition and its grade easy we made rapid time over its lower part, eager to see what lay between us and Mt. Joffre which was now directly ahead to the south. The glacier was so bare of snow and had so few crevasses that we did not rope until we were at about 9,500 feet, and not far from the mountain itself. At this point two routes suggested themselves: one slightly to the right up the snow-clad northwest face, very steep in parts, and probably involving much step cutting, and with a formidable-looking bergschrund some 500 feet below the snow cap; the other to the left over some sharp rocks to a saddle which it seemed might lead without difficulty to the summit. The latter was wisely chosen, and only its lower part involved any difficulty. Under a rock band from which stones were being dislodged by the melting snow, some hard ice had to be traversed by step-cutting, after which several sharp and none too solid excrescences of rock had to be ascended. These being gingerly overcome, we reached the easier rocks above, which were covered with fresh snow on which large hail stones were still intact. The saddle was gained without difficulty, and from it we proceeded along the final arête on the eastern side for over half an hour. There was just enough bare rock, rather wet with the melting snow, to enable us to avoid the steep snow slope. On the left hand there is a sheer and tremendous drop to the Petain Glacier. The broad snow dome of the summit was reached at 12.10 p.m. It was swept by a sharp northwest wind which soon drove us to seek shelter on the rocks below. Immediately below the summit at over 11,000 feet we noticed a flock of small and rather tame birds disporting themselves on the snow. The views, except of the splendid glaciers around us, were very disappointing; so thick was the atmosphere that Mt. Sir Douglas was invisible, while the peaks of the Royal Group loomed up very dimly.

It being not possible to crown the actual summit, we

+ marks route of ascent

20a

Photo, E. Feuz

SUMMIT OF MT. JOFFRE
And Crevasse on Mangin Glacier

made a cairn at the uppermost rocks and deposited therein a record. Shortly after one o'clock we began the inevitable but undesired descent by the now known route, after dismissing the thought of a variation which would probably have entailed much step-cutting and a slower return. Coming down fairly easily to the ice under the rock wall, and losing no time on it, owing to falling stones, we were on the Mangin Glacier again at 2.15 p.m.; soon thereafter the rope was put away, and fast time was made over the lower ice down which now poured countless rivulets. At 3.30 we were off the snow and bore to the left in order to ford the much swollen streams. Again we got thoroughly soaked as to the feet, and basked in the sun to dry ourselves and consume some food. Then began the wearisome tramp of three hours and a half to camp, along Foch Creek and Surprise Falls, almost down to the shore of Hidden Lake, whence we had again with gnashing of teeth to ascend and work through dreadful scrub in order to regain the scree slopes of the morning route. Moving along the sides of these was one of the most fatiguing things during the whole of our three weeks expedition. Considerably exhausted by our forced marches, we got back to camp at 7.45 p.m. The weather now looked more promising than ever.

Anxious for the welfare of his horses, Mishico was eager to get back to the main camp and determined to have us out of our sleeping sacks in time to make an early start. We heard him bustling about, tying up the horses and preparing breakfast long before we were ready to rise. He disliked the place and was delighted to leave. The morning was threatening, but no rain fell, and we returned to Kananaskis Lake in less than three hours. During our absence Mr. Stead had enjoyed some very good fishing in the stream connecting the two lakes, and displayed for our edification a large string of trout. ranging in weight from 1½ to 4 pounds, pink coloured and excellent food. As usual, after four days sojourn at

one place, a general cleaning up and sorting out process took place before night; there was more bathing in the lake, the water of which had a most pleasant temperature and we made ready to start northward on the morrow. The weather of the afternoon and evening was gloriously fine.

The next day was still warm, and the atmosphere less hazy. For the first hour and a half the scenery of the trail around the northerly Kananaskis Lake is charming, and the trail itself not bad, but thereafter most of it lies through miles of dreary, burnt timber and waste land. On the way we had good retrospective glimpses of the British Group, and saw a large rock slide in process of happening, the dusty clouds of which suggested at first the outburst of a fire. Our tents were pitched at 5.30 p.m. in a snug meadow alongside of the indefinitely designated Mud Lake; the following day at one o'clock saw the party again near the more southerly Spray Lake; the Forks were crossed and once more the valley of the Spray was ascended as far as Bryant Creek, this being the only part of the main trail which was traversed a second time. A high wind which prevailed during our passage through burnt and rotten trees, and brought some of them crashing down, was an unpleasant experience of the day. Another was a slight mishap, which happened to Mr. Stead and might have been exceedingly serious. His restive horse had a tendency to rush against the horses in front, and on this occasion the right leg of the rider received a kick intended for the animal. Had it not been for the puttees he wore and protective leather of the stirrups, his leg would assuredly have been broken. As it was, we had to stop to bind up the deep flesh wound which rendered his leg stiff and useless for several days.

On the afternoon of August 21st we reached Bryant Creek Meadows, where we spent the night. On the way up the valley the Assiniboine Group showed up very

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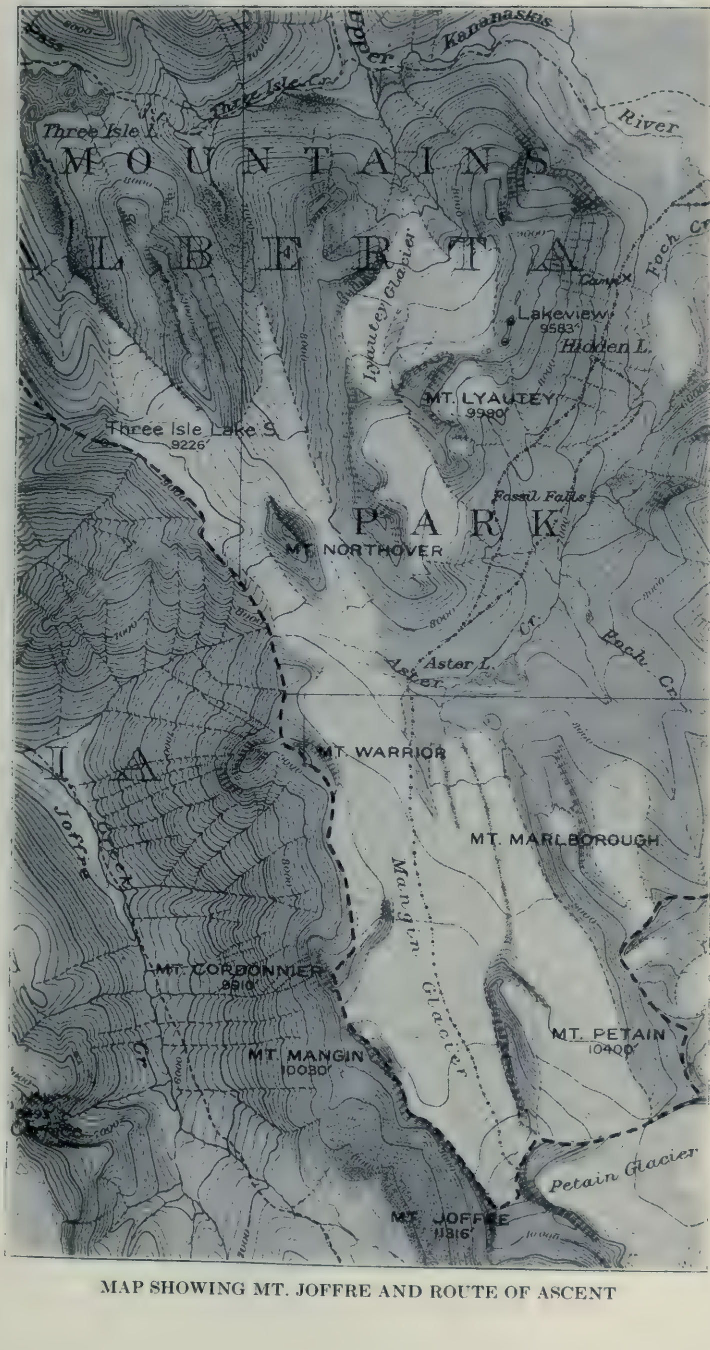


MAP SHOWING MT. JOFFRE AND ROUTE OF ASCENT

finely; most impressive is the tremendous eastern wall of Assiniboine itself; Mt. Aye and Mt. Eon stand out well, the latter the most striking thing after Assiniboine and more interesting as a mountaineering problem from here than at closer range. It resembles Prince Edward in the Royal Group. From a knoll near the camp we had a pleasing view of the chain of lakes between the peaks and our valley. Quite transporting was the view next day, when after a very stiff ascent on the trail to about 7,000 feet we emerged on the great meadows, from which the cirque of peaks shoots up in the most unexpected way. The contrast of foreground of thick grass, and groves of strong evergreens and background of snow-clad peaks is most surprisingly beautiful. Mr. Stead, who saw it for the first time, was astounded by and enthusiastic over the lovely grandeur of the scene, which impressed me more deeply, just as Niagara Falls did, on a second visit.

We camped on our former ground of 1910 at about 7,400 feet, which aroused interesting and pleasant memories of the joint expedition with A. F. Wedgwood, and which presented traces of the recent visit of Messrs. Eddy and Fynn. On a nearby tree was recorded their ascent of Mt. Assiniboine, a few days before, the details of which, embellished by one of the pony guides, later and more authentic information proved to be inaccurate. The mountain had more snow on it than at the time of our former ascent, but a careful examination of it with the glass led Feuz to declare that there was nothing formidable about its appearance, and to say that we should be able to do it in six hours. We were keen to make an attempt next morning, although Stead, who had looked forward to this climb, would, owing to the injured limb, be unable to join us. All afternoon, however, it looked very doubtful whether the weather would hold, but again we were lucky, for by 8 p.m. the threatening clouds had dissolved and a cool starry night

enabled us to look forward with some confidence to the execution of our plans. These involved an ascent by the western and north faces and a descent of the mountain on the southwesterly side.

According to the most recent determination, the height of Assiniboine is 11,870 feet, so that we had about 4,500 feet of ascent to perform and were about one mile distant from the lower band of rocks straight ahead of the camp, by means of which it is alone possible to reach the upper glacier on the western side. Feuz and I breakfasted excellently and without haste and left the camp exactly at five o'clock; once again by the combined assistance of lantern and moon. These lower reddish brown rocks constitute the most difficult and, if there is any danger at all, the only dangerous bit of the whole climb. A good deal of water, bringing down loose stones, is apt to pour over them, especially in the afternoon. At several places on the lower pitches we saw pieces of rope (not always fixed at the best or most necessary points) which had been used by the party of Miss Annie Peck, who had unsuccessfully attempted the peak a couple of years before. One of the ropes was used very conveniently on the descent; the others proved futile rather than helpful. In 1910 the snow led further up this rock band than now, and on reaching the glacier we found that it was also reduced in extent in nine years; and much more covered with morainal débris. Crossing it, we proceeded up some easy snow and ice on the left and thus gained the lower shale slopes and then the firmer rock of the upper massif. Here, on the gray rocks of the northwestern cliffs, it was agreeable climbing, and we were advancing well, when suddenly Feuz said we must put on the rope. There was less reason for doing so than there had been below; but we were getting higher and my reliable guide never runs any unnecessary risks. He removed my rather formal than serious objection by

saying that we must keep up the prestige of the peak. Of course, I should not have thought of descending it on this side unroped.

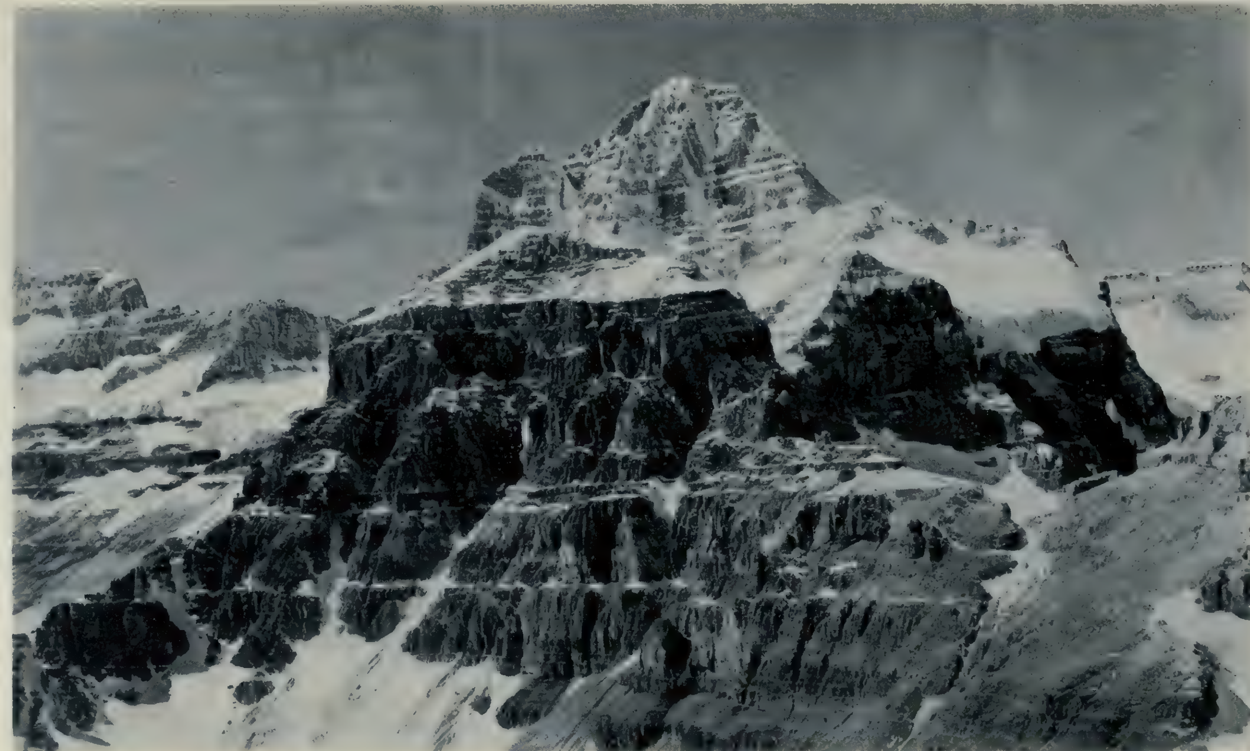
We continued on the northwest face and more to the left than on our previous climb, until we had surmounted the very remarkable band of red rock which runs horizontally around the mountain on the western side at an altitude of some 10,800 feet.* A few steps to the left on the top of this band brought us to the point at which the northern ridge meets it and affords a direct way of ascent to the summit. Below this the northern arête is very indefinite. Here we rested for some twenty minutes and munched some bread, cheese and chocolate. Starting again at ten o'clock we went steadily up the ridge without making any halt below the rock summit on which still rests Outram's record. The climbing affords most pleasant and not too strenuous exercise, on a fine ridge presenting several sharp rock noses; but, throughout, its quality altogether falls below that afforded by the northwestern ridge of Mt. Sir Donald. A very cool wind stimulated our activities; the rocks were miserably cold, and for some time we were glad to wear our mitts.

The rock summit was reached at 10.55 and the snow covered top ten minutes later. On the latter we had the opportunity of erecting the first cairn. Once out of the wind and protected between the summit and a cornice on the east side which had melted sufficiently to allow of a few rocks being exposed, we settled down to melt some snow and boil water, and after three quarters of an hour of watching and waiting enjoyed several cups of refreshing tea. Feuz and I had seriously spoken of camping over-night on top, and I think we would actually have done so, could we have induced Mishico to come with us and carry up a few things. Instead of this, our sojourn on the summit was limited to 1¼ hours.

*The topmost of three bands which so encircle it.

Although the views were unsatisfactory it was very delightful up here, and our enjoyment was enhanced by the recollection of our previous experience when the atmosphere was so murky that even Mt. Eon was invisible and our party nearly went down in a terrific storm.

On looking down over the southwesterly side of the mountain by which we proposed to descend, it did not appear very formidable, but not seeing the way clearly we were not prepared for the surprise which this side of the peak presents. Almost immediately Feuz suggested taking off the rope, to which I demurred; but he was well justified. Much of what we had to pass over was loose stones and gravel and the only difficulty we had was in finding the right way over the ledges and around, instead of down the broad couloirs which were now receiving streams of stones. An ascent by this southwest side can be nothing more than a long, steep walk; there is no necessity for gymnastic activity because every one of the precipitous bluffs can be circumvented in a more or less easy way. We lost much time by attempting to descend too quickly, and, thereby missing the way, had more than once to retrace our steps. Eventually striking to the right, we followed a narrow ledge of shale under the great rock band connecting with the small pass on the southwest side of the mountain. This long traverse on yielding gravel consumed an hour and was most tiresome; and, almost at the end of it, a deep couloir looked as if it would block the way, but happily we could circumvent it, and reached the pass at four p.m., now a long way from camp. In a few minutes we were on the snow of the western side which was hard but, at first, fairly level. It soon, however, became steep, and the icy slope which confronted us on the further side presented difficulties of descent with suggestions of much step-cutting. The latter was by all means to be avoided at this time of



Photo, A. J. Campbell

EAST FACE OF MT. ASSINIBOINE FROM MT. TOWERS
Mt. Magog Lies Between

day, so, by manoeuvring a bit and crossing some outjutting rocks on the left, we discovered an easier route in softer snow. The wide crevasses running across the ice-field at right angles to our route appeared at first to bar the way, and for a few minutes we felt uneasy as to the outcome. In the end, we had to risk our weights, separately, of course, on two very flimsy snow bridges, which were negotiated with great caution, one man paying out very gradually to the other the rope, which was wound round a deeply placed ice-axe. After this the rope was taken off finally; there followed a short descent over the snow to a glacier stream and a sharp ascent lasting about twenty minutes of some forbiddingly piled but easy boulders to the saddle or first pass seen from the camp, with which the northwest glacier connects. Shortly after six o'clock we were able to "take up" our morning route and retracing it over the lower rocks arrived at camp just before eight o'clock. We had accomplished by a considerable circuit what we had long wished to do, and were both satisfied and disappointed with the experience. The country of Assiniboine is splendid; as a mountaineering problem the peak is over-rated. Of this I am still more convinced than I was after the first ascent; and in saying this I bear in mind the well known tendency of some climbers to under-estimate a peak which they have successfully overcome.

Another fine evening was followed by another magnificent day; it seemed as if on this trip the weather could not break. We had carried out almost to the hour what we planned weeks before, much as we had been able to do in Switzerland in the wonderful summer of 1911. We crossed Simpson Pass on the 25th; on that evening Mishico gave us another, I hope not the final, illustration of his culinary powers. Next morning our camp was shrouded in a heavy mist; there was a rainy feeling in the air, but a little later the sun shone out brilliantly and we made a happy entry into Banff the same afternoon.

FIRST ASCENT OF MT. KING GEORGE

By Val. A Fynn

We reached Lake Louise July 23rd. The first few days were devoted to training trips. I traversed Mt. Whyte (9,786 feet) alone on the 24th. On the 27th, Mr. and Mrs. Eddy, Mrs. Fynn, Rudolph Aemmer and myself went to Abbot's Pass (9,588 feet) and back. Throughout this period the weather was uncertain.

On July 29th Rudolph and I took a boy about seventeen up Mt. Aberdeen (10,340 feet) by way of the icefall of the Aberdeen Glacier which comes down between Aberdeen and Haddo. This glacier lies at the head of the beautiful little valley which descends to Paradise Creek between Fairview and Saddleback on one side, and Haddo and Sheol on the other. Rudolph Aemmer and Edward Feuz, the two Swiss guides stationed at Lake Louise, some years ago reached the snow saddle between Haddo and Aberdeen from the foot of the icefall in question by taking to the steep and somewhat rotten rocks to the east of same. It was our intention to repeat this route, but when we reached the foot of the rock wall at about 12.30, having left the hotel at 7.50 a.m., we found that the whole face was alive with falling rocks and an attempt to scale it would have been foolhardy. This condition was brought about by the unusually small amount of snow and was to give us considerable trouble in practically every ascent which we made in 1919. The trouble, of course, became worse as the season progressed. Under these conditions, we either had to descend the Aberdeen Glacier until it became possible to traverse to the foot of the Haddo Glacier and reach Aberdeen over Haddo, as I had done in 1917, or force a passage through the icefall. Inspection of the latter

showed it to be in a condition favorable to such an attempt, and we started immediately. On the left, or eastern side of the fall, is a narrow ice gully next to a very high and almost perpendicular ice cliff. This seemed to be the most suitable way of reaching the middle portion of the icefall, which was much broken up and did not seem to present any difficulties. Rudolph started cutting the necessary steps, but, owing to a little overhang, was presently forced to stand on my shoulders. As he went higher, I was able to steady his feet in the ice steps with my hand and he presently overcame this first difficulty. The middle portion of the icefall proved easy and we made good progress, keeping to the right and away from the steep cliff, about the security of which we were not very certain. Presently we were stopped by a very deep chasm running almost horizontally across the entire fall. The lower lip of this chasm had effectively concealed it up to this time. We were now forced to traverse back to the left, balancing on the narrow edge of this lower lip, and finally emerged on easy ground well above the highest cliff previously referred to. The saddle between Haddo and Aberdeen was reached at 2.30, and, after a rest and some luncheon, we topped Aberdeen at 3.35. Leaving at 4, Haddo (10,073 feet) was reached at 4.30 and the cabin on Saddleback at 7, by way of the Haddo Glacier. This trip put me in fair condition, and I thought I was now ready for some of the better expeditions, but the weather was so uncertain that nothing serious could be undertaken.

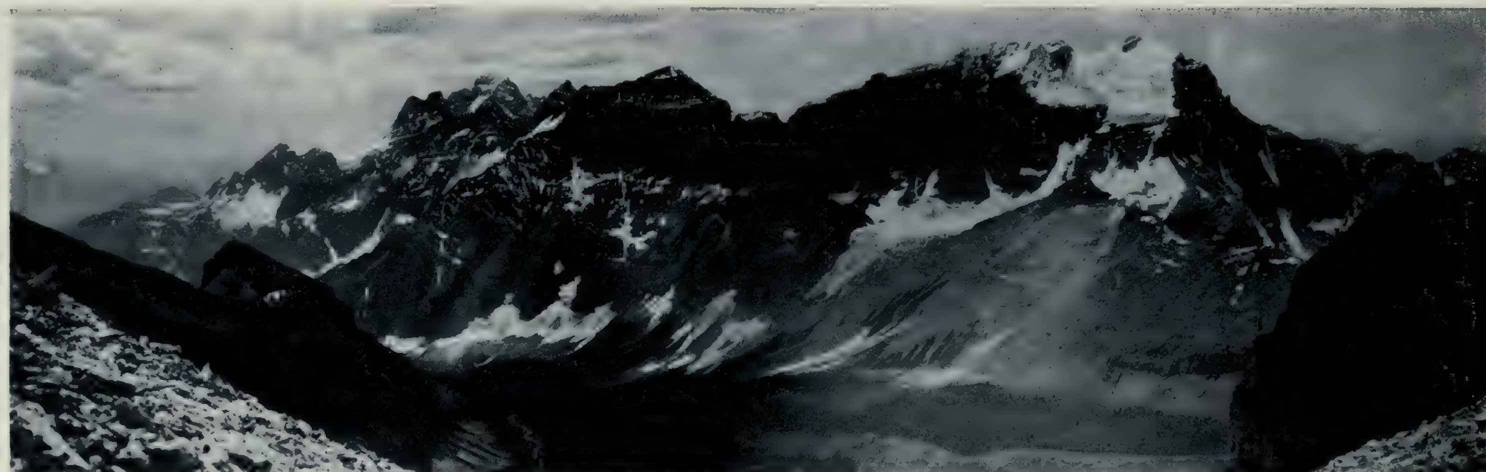
In the meantime Mr. Eddy suggested that we go on a camping trip down to the Royal Group and visit Assiniboine on the way. This suggestion was extremely attractive and immediate preparations for the trip were begun. The Potts Outfitting Company, of Morley, undertook to supply us with guides and horses, and we had every occasion to congratulate ourselves on having accepted their offer, for the outfit proved eminently

satisfactory. The horses were all in fine condition and the men proved very able and most agreeable companions.

The Royal Group

The Royal Group is almost due south of Banff at a distance of about forty miles "as the crow flies." Our attention was called to this group by reports of surveyors and particularly by the report of the commission appointed to delimit the boundary between the provinces of Alberta and British Columbia, the first part of which was published in 1917 by the Office of the Surveyor-General at Ottawa. In this report, Mr. A. O. Wheeler shows a photograph of the whole range taken from Mt. McHarg, which lies on the east side of the Palliser River Valley. It appears that the highest peak of this group, the number of prominent peaks of which happens to coincide with the number of members of the Royal Family, was first seen by Mr. Wheeler in 1913 from Wonder Peak (9,300 feet), which lies north of Marvel Lake, east of Mt. Assiniboine and some twenty miles north of the Royal Group. Mr. Wheeler tells me that he named this peak "Mt. King George" at that time. Later, during his survey work, he came within five or six miles of the group, located same on the map, and ascertained the heights of the main peaks. This group is about five miles long and, in the main, runs parallel to the Palliser Valley, where the course of the latter is almost due south. The most easterly summit, Mt. Prince George (9,450 feet), is the lowest. Next to it in height is Mt. Princess Mary (10,090 feet), which is the most southerly peak. All the others are above 10,500 feet, and Mt. King George is 11,226 feet.

We decided to approach the group by following the Spray River to Palliser Pass (6,836 feet), and arranged to leave Banff on August 2nd. On August 1st I left Lake Louise for Banff, with the intention of supervising our final arrangements. The rest of the party, consisting



Photo, Val. A. Fynn

THE ROYAL GROUP FROM THE NORTH (PASS SOUTH OF TIPPERARY GLACIER)

of Mr. and Mrs. Eddy, Mrs. Fynn and Rudolph, were to arrive in Banff by the first train on the following day. August 2nd broke threateningly, but the weather improved somewhat towards noon. The party arrived from Lake Louise in good time, but we were unable to leave until 3 p.m. owing to some unforeseen complications. Our chief pony guide was "Waddy" Potts. He also officiated as cook. Robert Baptie and Jack Fuller acted as horse wranglers. Our party of eight and sixteen horses started from Banff Springs Hotel and immediately struck south, following the western shore of the Spray River. After a few miles the trail crosses the river on a recently built bridge and abandons same, not rejoining it until after the Spray lakes have been passed. That day we made camp at 7.30 well beyond Canmore Gap in a spot where water was very difficult to get (14 miles). This, of course, was the result of our late start. The next day, we left at 10 and made a camp a little beyond the second Spray lake (12 miles) on the shores of the Spray River, and just where the trail branches to Kananaskis Lakes. The fishing at this spot is supposed to be very good, but the fishermen of the party were unable to add much to the larder, probably because the Canmore miners had lately been in the habit of spending much of their time in this district and had, no doubt, fished the river dry. It began to rain during the night and rained steadily all of next day. The rain was so intense that we decided not to move camp and it was only on August 5th that we continued our journey up the Spray. A most enjoyable ride took us past the entrance to Bryant Creek (5 miles) in ever brightening weather. Beyond Bryant Creek the trail was found to be very rough for a couple of miles and we had some trouble with our pack horses. Towards noon we found ourselves at the entrance of White Man Creek and knew that we had missed the right trail. Unfortunately, we were unable to secure detail maps of this country prior to our

departure and now felt the need of one for the first time. As a matter of fact, we ought to have crossed to the eastern bank of Spray 2½ miles beyond Bryant Creek, just where the Currie and White Man Creeks flow into it. We finally decided that the quickest way out of the difficulty would be to strike due east across country. This was done and the right trail was very soon picked up. At this point the Spray Valley broadens out and, no doubt, permits a good view of the high peaks in the neighborhood of Palliser Pass, but we could only guess at these for the reason that the clouds were still very low. At 5 p.m. we made camp on the eastern slopes of the valley, just opposite Spray Pass and Leman Lake, which lies at the foot of same, but cannot be seen from the Spray Valley (13½ miles).

On August 6th Rudolph and I left camp early, with a view to studying the country from Palliser Pass, which was now within 4½ miles of us, and decide whether our next camp was to be pitched on the Pass or beyond same, in the Palliser Valley. We made the pass easily in two hours, left our horses near the monument and climbed one of the hills to the east. From our last camp, and on our way up, we could see that Mt. Sir Douglas (11,174 feet), which stands just east of the Palliser Pass, was a very fine peak, but the low drifting clouds never permitted a good view of the mountain. These clouds continued to interfere with our inspection of the neighborhood and, in the absence of a map, led us to the conclusion that the twin northerly peaks of the Royal Group, Prince John and Queen Mary, were located immediately behind Mt. Back (9,883 feet) and an unnamed peak just south of Palliser Pass. The deep Palliser Valley which we could overlook from our point of vantage promised such rough going, and the open spaces and beautiful lakes on Palliser Pass looked so attractive, that we decided to suggest to the rest of the party that our main camp be located on the Pass. On

ON TRAIL TO PALLISER PASS --PACKING UP OUTFIT

Photos, Val. A. Fynn

ON TRAIL TO PALLISER PASS --CROSSING SPRAY RIVER

the north side of Palliser Pass lies the Belgium Lake in an open fairly flat space, nearly one square mile in extent. Just beyond the Pass and on its southern side are two lakes located one above the other. Back Lake is the larger and the higher. It is in the main fed from glaciers which descend from Mt. Back and from an unnamed peak to the east thereof, and is the real source of the Palliser River. Palliser Lake receives its water from Back Lake. Immediately west of Belgium Lake is Mt. Queen Elizabeth (9,349 feet), with Mt. King Albert (9,800 feet) behind it, and east of the lake is Mt. Sir Douglas (11,174 feet), with Mt. Monro (10,145 feet) immediately south thereof.

Looking down the Spray Valley, Mt. Smuts (9,600 feet) is the only peak which attracts attention. It is a rock summit in the shape of a sugarloaf and looks quite difficult. Looking down the Palliser Valley from Palliser Pass, none of the Royal Group can be seen but Mt. Joffre (11,316 feet), some thirteen miles to the south and slightly east, is easily the most striking object in that region, although some of the other peaks east of Palliser Valley also look attractive.

The rest of the party arrived at 1 p.m. and camp was made just east of Belgium Lake and near its southern end. While Rudolph and I had been examining the neighborhood we discovered some goats on the eastern slopes of the unnamed peak east of Back, so in the afternoon, Mr. Eddy, Rudolph and myself went in that direction, not only to get a closer view of these interesting animals, but also to further reconnoitre in the direction of the Royal Group. We finally reached the southern ridge of the unnamed peak and looked down upon Tipperary Creek and a large glacier at its head, which might well be referred to as Tipperary Glacier. At the head of this glacier, and to the south of it, stand two easy-looking peaks which, in the absence of a map, we took for Prince John and Queen Mary. As a matter

of fact, the two last named peaks are just about three miles beyond the peaks we were looking at and exactly in the direction in which we were looking. After taking some photographs, we circled around the unnamed peak east of Back and descended to Lake Back by the glacier just west of the unnamed peak. We felt pretty sure that the two peaks at the head of Tipperary Creek were Prince John and Queen Mary, for their shape agreed fairly well with the appearance of said peaks in the photograph published by Mr. Wheeler in his report and the long and steep wall between Prince John and Prince Henry appeared to be exactly duplicated by the long and steep wall west of Tipperary Creek. We went back to the camp with the idea of taking the two ladies up one of these virgin peaks the next day. Accordingly, on August 7th, the whole party, with the exception of the packers, left camp at 7 and climbed to the saddle east of Mt. Back by way of Lake Back. After descending to the Tipperary Glacier, the gap between the supposed Queen Mary and Prince John was easily reached, whereupon, we immediately realized our mistake, for the whole of the Royal Group stood revealed right across a deep and beautifully wooded valley, in which we later discovered a herd of ten elks with two or three fine heads among them, and to which I will refer as the Royal Valley. This discovery was a very sad blow, particularly to the ladies, who up to this time had been under the impression that they were going to make the first ascent of one of the principal peaks of the Royal Group, but nothing could be done, and we settled down to a closer examination of the country. The weather was now perfect and every detail stood revealed. It became apparent that Mt. Queen Mary could be reached from Tipperary Glacier by circling around the peak we had taken for Queen Mary, descending into a high valley beyond, traversing same and attacking the peak from the northwest. It also looked as if access could be gained from the northeast just to

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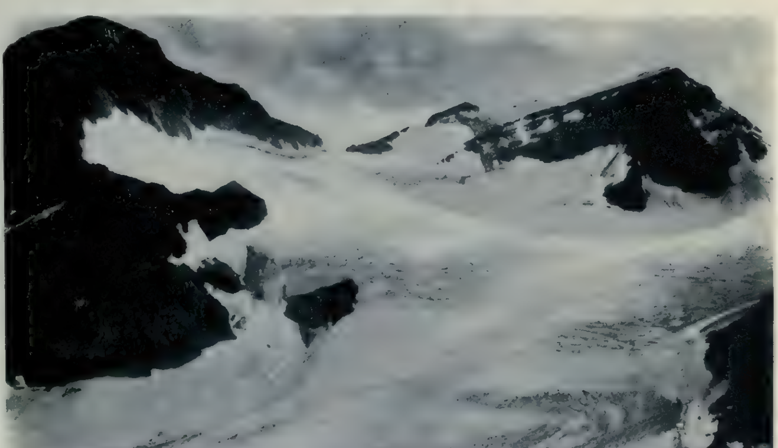
PALLISER PASS ACROSS THE CONTINENTAL DIVIDE



Photos, Val. A. Fynn

UNNAMED PEAKS AND PASS SOUTH OF TIPPERARY GLACIER

the right of the beautiful hanging glacier which entirely covers the peak on this side. Such an expedition was, however, clearly beyond the reach of the ladies and would require a bivouac at the foot of Queen Mary. After watching the animals down in the Royal Valley, admiring the Royal Group and settling upon a mode of approach to Mt. King George, it was decided that the ladies should go back to camp with Rudolph, while Mr. Eddy and myself were to climb the false Queen Mary. When about half way up, we found that those left behind were following us. Rudolph never relished the idea of going back to camp when within a few stone throws of an unclimbed peak, and finally persuaded the ladies to let him take them up. We enjoyed a magnificent view from the summit. Mt. Assiniboine was clearly to be seen in the north. The Royal Group, immediately to the south, looked better than ever, and Mt. Joffre, with his attending satellites, looked very imposing. We descended by the northwest ridge of the false Queen Mary, traversed over to the southeast ridge of Mt. Back, crossed same and descended to the gap above Lake Back over some very steep snow and ice which gave the ladies all the thrills they wanted. On the way down we had a splendid view of Mt. Sir Douglas, but could not agree on the best line of ascent. From this side, the peak looked undoubtedly difficult.

The weather being very fine, and appearing settled, it was thought best to make our attempt on Mt. King George without further delay. Mr. Eddy did not feel in sufficiently good training to attempt the probably strenuous trip, so on August 8th Rudolph and I took Rob and five horses and descended to Palliser Lake. Up to that point, the trail is well marked and presents no difficulty, but on the east side of the lake it suddenly turns east at a point where it is hardly marked and crossing a ridge dips down into a deep gully, parallel to the one in which the lake is located. The slope is here very steep, the

trail dropping 1,000 feet in a little more than one mile and, although fairly well marked, we found it extremely difficult to follow because of the large amount of windfall. The whole of the Palliser Valley was burnt out many years ago, and nothing but bare tree trunks are to be seen. Their roots are, of course, decaying, and many of these trunks go down with every wind storm. Nobody had been in this district for many years. The last of the very few parties which have visited this region was probably Mr. Wheeler's at the time he surveyed this part of the boundary, and I do not think he went beyond Le Roy Creek. Our difficulties began as soon as we stepped on to the steep slope, and we advanced at a snail's pace, for it was necessary to cut a way for our horses. At one point, one of the pack horses did not wait its turn to negotiate an awkward corner, attempted to vault a huge trunk a little to the side of the place we had cut out, and in so doing lost his balance and went rolling down the slope. Luckily his progress was arrested by another trunk, the pack wedging under same and holding the animal with all four feet in the air. A good deal of work was required in order to bring the pony back into line and it was very lucky indeed that we had enough rope with us, for both front and hind legs had to be tied to trees while he was being unpacked and the ropes were also used in order to pull him into a position from which he could rise. Repacking on that steep slope was also quite a job, but it was finally achieved and the journey resumed. This very horse was carrying my camera which I had put away, thinking that there would be nothing to photograph on this particular day. No better subject could have been found than this cayuse when at the worst of its difficulties! The struggle continued without intermission. After the 1,000 feet of steep descent the trail became almost entirely obliterated and the timber very much thicker and larger. We had two axes with us but no cross-saw. Packers

are very adverse to carrying a cross-saw, alleging that they always cut their ropes or the packs, but it is only necessary to cover the teeth of the saw with leather in order to make them harmless and a saw saves a good deal of time. In camp it also economizes wood. Rudolph kept the lead almost throughout the day, I helping to chop the trees and move the scenery, while Rob was kept busy looking after the five horses. In an awkward place near the river another horse rolled over and the ropes again came into use. Throughout this day and the following Rudolph proved himself a first class woodsman and the line he selected was most certainly the best available. At that, it was difficult enough to make us often wonder whether we would ever succeed in reaching the flats. We struggled on and on without rest and when we made camp at 8.30, not far from the mouth of Le Roy Creek, we had covered a bare four miles. We camped in a swampy bottom and that night slept on willow branches with the horses grazing all about us and porcupines creeping over the roof of our tent and trying to get at our provisions.

There was a little rain during the night, but the next morning broke fine and we were off at 10. This August 9th was a repetition of the previous day's performance, except that there was more timber than before, and that we only got occasional glimpses of the almost entirely obliterated trail. After we had passed the mouth of Tipperary Creek conditions improved considerably and we were able to make better progress. We never stopped for lunch and at last at 4 p.m. we reached the creek which comes out of the Royal Valley in which we had seen the elk and out of which Royal Group rises (3½ miles). We had decided to make our way up this valley to the foot of Prince George. We made camp on the south side of the Royal Creek, and after a hearty meal and a little rest Rudolph and I shouldered our packs and began our climb at 7.30 p.m., having decided

not to attempt to take the pack train any further. We agreed to carry nothing but provisions, a sweater and a raincoat, and left Rob in charge of the camp and of the horses.

The entrance to the Royal Valley is narrowed down by steep ridges to the north and south of the creek and the extent of it is not realized until one of these ridges has been climbed. When we had a good view of Mt. King George from the head of the Tipperary Creek we decided that the best way to attack it would be along its north ridge. The hanging glacier seen between Mts. Prince George and Prince Albert and the ice slopes on the eastern side of the north ridge of Mt. King George led us to believe that we would find a glacier behind Mt. Prince Albert and between Mts. Prince George and King George. We, therefore, decided to climb to the flats seen east of Mt. Prince George, go around or over the latter on to the glacier which we expected to find, pass back or south of Mt. Prince Albert and thus reach the eastern slopes of the north ridge of Mt. King George. In order to reach the flats east of Mt. Prince George it appeared to us best to climb the ridge guarding the entrance to the Royal Valley on the south, and this we proceeded to do. For hundreds of yards we walked on tree trunks without ever touching the ground, and very soon realized that we had been wise in abandoning the pack train. Where the slope was steep we had to push our way up through thick undergrowth interspersed with fallen trees so that our progress was not very rapid. We kept coming across patches of large and very delicious blackberries* and allowed these to delay our progress still further, although the night was coming on fast. Finally, we came near the edge of the timber and traversed in a westerly direction to where we could hear water. At ten o'clock we stopped at about

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*It is thought that the writer here refers to the huckleberry (*Vaccinium*), which are abundant on these mountain slopes.—Ed.

timberline in the first gorge west of the wooded ridge which guards the entrance to the Royal Valley, made a fire and rested until it was light enough for us to proceed. At about six o'clock on the 10th, after leaving some of our extra clothes behind, we climbed over grass slopes, screes and snow patches to the foot of a steep rock wall above which we could see a nice small and sheltered valley in which grew a few trees. A snow couloir and some steep rocks, a traverse to the east, and we stood in the little basin. This spot would make a very pleasant bivouac ground, although firewood is not very plentiful. From here we reached the flats east of Mt. Prince George without difficulty at 8.20 and, after a breakfast, proceeded to cross the south ridge of this peak. To this end we had to scramble up some very loose shale slopes to the foot of a small glacier, which we skirted along its north edge. This brought us to the foot of our ridge. The ascent of Mt. Prince George from this point presents no difficulty whatsoever, and we watched a goat go to the top. Not knowing just what lay on the other side, we thought it better to follow what we imagined would be the shortest line, and therefore proceeded to cross the ridge by means of a very steep snow couloir. We were delighted to find that our bold guess as to the existence of a convenient glacier south of Mt. Prince Albert was correct. A very large glacier fills the basin between Mts. Prince George, Prince Albert, King George and Princess Mary, and drops south and out of sight down a deep cut side valley which runs into the Palliser Valley soon after the latter makes its sharp turn to the west. The panorama shown was taken from this spot, which we reached at 10.30 a.m. The weather was very fine, but a few clouds hung around the summit of Mt. King George.

We quickly decided that our best plan was to cross what may be called the King George Glacier and try and reach the north ridge of our peak by way of the very steep, but nevertheless, promising looking rib just north

(to the right) of the small hanging glacier located on the eastern slope of the mountain. The descent to the glacier, begun at 11, was easy and the crossing of same presented no difficulty. At 12.05 we stood in the pocket between Mts. Prince Albert and King George and near the foot of our rib. Here we took lunch and left one of our rucksacks. Starting at 1 p.m. we were soon at grips with the enormous bergschrund. Luckily part of the upper lip had broken away at one point, partly filling the chasm, and enabling us to cross same on a rather precarious bridge. The ice slope above the schrund was extremely steep, but luckily in good condition, and we soon reached the rocks. These proved excessively steep in the lower part of the rib, but were very firm and afforded one of the best climbs we had had anywhere in the Rockies. Unfortunately this welcome condition did not last, the upper third of the ridge being composed of a very brittle kind of rock requiring very careful handling. In a surprisingly short time we reached the ice ridge well seen in the photograph and which connects our rib with the north ridge of the mountain. Being in the lead I began cutting the necessary steps, while Rudolph was making a careful survey of the surroundings, with a view to possibly improving on our route on the way back, but after a while I came back and asked him to finish the job, I feeling somewhat tired and my hands being still swollen from much handling of the axe down in the Palliser Valley. The north ridge, which was reached at 3.15, gave us a most enjoyable climb, partly on ice and partly on rocks, with an occasional fairly difficult passage, and at 5.07 p.m. we reached the summit of Mt. King George (11,226 feet), being rewarded by a practically perfect view, in which the immediate neighborhood and Mt. Joffre formed the most striking features. The rock on the lower part of the mountain is limestone, around the summit it is quartzite. After building a large stone man and taking sundry

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photographs, we began the return journey at 6 p.m. The top of the rib was reached at 7.25 and the bergschrund crossed at 8.35. While partaking of a little food, we tried to make up our minds as to the route which we were now to follow. We both felt somewhat disinclined to again climb over the south ridge of Mt. Prince George and very foolishly, in view of the late hour, finally decided on going around said ridge. This route proved easier, it is true, but much longer, and the moon had been shining quite a long time when we at last reached the flats east of Mt. Prince George and began the descent to our bivouac. All the steep parts of the climb were, as luck would have it, in the shadow, and our progress was difficult and slow, but at 12.55 a.m. we finally did reach our last night's bivouac. It was out of the question to negotiate the remainder of the route back to our horses during the night, so we lit another fire, brewed some coffee and finished our provisions. As soon as we had eaten, I crossed over to the far side of the fire, wrapped myself in my mackintosh and Rudolph told me next morning I immediately fell to snoring. Towards four o'clock, the cold woke me up and I found the fire low. In rebuilding same, I noticed that friend Rudolph had dropped in his tracks and lay on his stomach with arms flung wide and right over the remains of our food, sleeping soundly. He must have been a very close second.

When it was light enough, we packed our belongings and entered upon the last leg of the journey, reaching our main camp shortly before 8 a.m. Rob had been expecting us on the previous night and had sat up until late, keeping a bright fire going. We now found him sound asleep, but he was up in a minute and soon had prepared a most delicious meal. At 10.30, all our belongings were packed and in beautiful weather we began our return journey to Palliser Pass. Having very carefully blazed the trail, we expected no difficulty and indeed did not experience any. This, however, was not entirely due

to the good blazing, but to the remarkable intelligence of one of our pack horses, a wiry little chestnut mare, who took the lead and never faltered but twice, leading us at an extremely fast pace through the maze of brulé and underbrush right back to Palliser Pass. We had more leisure to look at the scenery on this trip and found the country very interesting indeed. Game is evidently plentiful and bear must be particularly numerous. The fire-weed grows in great profusion and its bright red-purple color adds much to the beauty of the scene. In many places, this weed is fully six feet in height and horses entirely disappear from view as soon as they enter a patch of it. The return journey was, however, not accomplished without incident, the extremely rough going made it almost impossible to keep the cinches tight. While crossing a deep ravine, Rob's hat was knocked off by a branch. I was following him and while stooping to pick it up, my saddle slipped and I found myself on the ground with one foot fast in a stirrup. Rob, who saw the incident, was able to immediately catch my horse and thus prevent serious damage. Later, while going up a very steep bank, covered with brulé, Rob's saddle slipped back, whereupon, his horse promptly kicked the saddle and Rob way down the hill. Fortunately, he was not seriously hurt, although his back did come into rather abrupt contact with a large tree trunk. Near the top of the pass, at a spot which was so steep that we all got down and led our horses, Rudolph's charger got away from him, wandered off the trail and gave considerable trouble before it could be caught. Nevertheless, we made remarkably good time, and in four hours, at 2.30 p.m., were being welcomed by the rest of the party at our Palliser Pass camp.

We now heard that Dr. Hickson with Ed. Feuz and a pack train had pitched camp in the Spray Valley, just below Palliser Pass, and intended to make the ascent of Sir Douglas. On our way down the Palliser Valley, we

had a glimpse of the southwestern side of this mountain and thought that an attempt from that side might be successful. In the hope of being the first to reach this summit, Rudolph and I left camp the following morning, August 12th, at 6.30 a.m. and crossed an intervening lightly-wooded ridge to the southwest foot of the mountain. As can be seen, there is a deep cut valley between the southern ridge of the peak which unites it to Mt. Monro and the southwestern ridge. The latter divides into two diverging ridges which enclose a pocket filled with scree, out of which protrudes a large island of solid rock. Our idea was to get into the deep cut valley at the foot of Mt. Monro and then work our way up to the southern ridge of Sir Douglas, somewhere in the neighborhood of the steep ice-filled gulley which appears in the photograph on the western side of the south ridge. As we approached the mountain it seemed to us that it would be better to enter the pocket formed by the bifurcation of the southwestern ridge and to gain this ridge somewhere near the point where it divides. We were in the pocket at 8.15 a.m. and after a short rest, during which I changed my hobnailed boots for climbing shoes, we struck north and reached the western branch of the ridge close to the point where it divides, at 10.45. Here we found that progress was absolutely barred by a huge gendarme just beyond the point of division. Notwithstanding all our efforts, we were unable to discover a way around the difficulty and turned back at 11.20. We descended to the height of the island of rock, previously referred to, then traversed above it and crossed the southerly branch of our ridge where it flattens out, forming a shoulder on which a long and a short strip of snow are seen in the photograph. We could now see the head of the deep cut valley at the foot of Mt. Monro, and found that it holds a glacier which leads up to the ice couloir, the top of which is clearly seen in the photograph, and which reaches high up on the southern ridge of Sir

Douglas. It was immediately evident that we were up against a very difficult problem. Had it been possible to cut one's way up the ice couloir, things might have been different, but it was now nearly one o'clock and stones were continually coming down this ice slope. The rocks above it did not look by any means easy, but they can probably be negotiated. The south face appeared to offer the only chance, so we tackled it immediately. Rudolph not being provided with climbing shoes, I took the lead and struggled hard to make progress over extremely difficult and very steep rock. We reached a considerable height, but finally had to give it up, turning back at 2.45, probably within 700 feet of the summit. The descent to the glacier was by no means easy, but we finally accomplished it and followed the little valley at the foot of Mt. Monro. This mountain is of very interesting formation. Neither of us had ever seen such vile scree or so much of it in one valley. The Dauphiné, with its famed shale slopes, cannot compare. At last we left the scree behind us and traversed in an upward direction, emerging close to the spot where we had entered the pocket in the morning and thence returned to our camp, reaching it a little after six. We there learned that Ed. Feuz had taken Dr. Hickson to the summit of Sir Douglas the previous day and that we could have seen their stone man before leaving camp, had we taken the trouble to look. It was pointed out to us now. It appears that Ed. Feuz with Dr. Hickson and a friend of the latter, left their Spray Valley camp with a view to reconnoitering and ascended by way of one of the glaciers on the north side of the peak. Encountering no difficulties, the party kept on and happily reached the summit in a very short time from camp, thus accomplishing the first ascent of this very fine peak.

As far as we could see, it would be quite difficult to approach the Royal Group from the west. Mt. Queen

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MT. SIR DOUGLAS AND MT. MONROE
From Slopes S.W. of Palliser Lake

Photos, Val. A. Fynn

MT. MONROE FROM SOUTH FACE OF MT. SIR DOUGLAS

Mary and Mt. Prince John can undoubtedly be reached from Palliser Pass and climbed from a bivouac north of these peaks. This bivouac could be reached from Palliser Pass in something like eight hours. It is possible that these peaks can also be reached from the Albert River Valley, but I do not know whether there is a trail in that valley, although there is one as far as Spray Pass. Mts. Princess Mary, King George, Prince George, Prince Albert, Prince Edward and Prince Henry, can all be reached from the Royal Valley, access to which can be had from the flats of the Palliser River. King George Glacier can possibly be reached from the south by following the stream which flows out of same, but, to this end, it would be necessary to go down Palliser Valley beyond the point where it turns west. This, I know, will require a good deal of work because the brulé is there thicker than ever. The side valley leading up to the King George glacier may also present very serious difficulties. Our observations lead us to believe that Mt. Princess Mary can readily be reached from King George Glacier over its north ridge. It will probably be a good, but not difficult climb. Mt. Prince George is interesting as a view point, but is nothing but a shale slope on the south. Both peaks of Mt. Prince Albert can readily be reached from the head of King George Glacier. Mt. Prince Edward is probably the best climb after Mt. King George. The best approach appears to be from the Royal Valley up the eastern face to the gap between Mts. Prince Edward and Prince Henry. From this gap both of these peaks can apparently be reached, the easiest approach to either being from the west, which means a traverse from the crest of the main ridge to the western ridges. Mt. Queen Mary will probably afford another fine climb next in difficulty to Mt. Prince Edward. The easiest approach appears to be from the west, the next best route from the northeast. Mt. Prince John is really nothing but a second summit of Queen Mary, and can readily be

reached from the latter. The ideal way of exploring this group would be to take a pack train up the Royal Valley and make camp near timberline, at the foot of Mt. Prince Edward, exploring the southern end of the group and then move camp to the highest and northerly part of the Royal Valley, from which, Queen Mary and Prince John could be climbed. A good deal of work, will, however, be required to cut a trail to the first camp, and it may not be altogether easy to take the horses to the second. The upper part of the Royal Valley is very beautiful, but rather thickly timbered, and big game is very plentiful.

Mt. Assiniboine (11,870 feet)

The next day, August 13th, we all worked hard to break camp, and get away as soon as possible. The ladies and Mr. Eddy had enjoyed their stay on the shores of the beautiful Belgium Lake very much indeed, but were now ready to move on. We started at 11 in a light rain and made our way rapidly down the Spray Valley, our intention being to camp that night high up in Bryant Creek, somewhere near Marvel Lake. We kept to the east side of the Spray River all the way to the two sets of tepee poles which stand on the camping ground near the point where Currie Creek runs into the Spray (2 to 2.15), crossed to the west side of the river and soon branched off into Bryant Creek. The weather showed signs of improvement and we made good progress, although we lost a little time at the entrance to Bryant Creek because some of the ponies insisted upon following the Spray. To the surprise of everybody, we reached the camping ground near Marvel Lake (17.5 miles) at 4.40, leaving us plenty of time to walk to the knoll, from which such a beautiful view is had of Marvel Lake and the Assiniboine Group, comprising Mts. Gloria, Eon (10,860 feet), Aye (10,640 feet) and Assiniboine. The clouds still hung around Assiniboine, but, otherwise, everything was clear and appeared in a very beautiful light. We

took it easy on August 14th, knowing that we were within but a short distance of our next camping ground near Lake Magog, on the north side of Mt. Assiniboine. Leaving camp at noon, we left Allenby Creek on the right, skirted Gibraltar and Cascade Rocks and climbed the partly steep trail leading to Assiniboine Pass (7,152 feet). From this point the trail winds in and out through nearly level green meadows with occasional patches of trees and with Mt. Assiniboine in full view all the time. We found a beautiful camping ground after a ride of two and one-half hours, a little north of Lake Magog in a little grove of pine trees (8 miles). Towards the evening, all the clouds cleared away and Mt. Assiniboine was revealed in its full glory.

August 15th proved to be the most perfect day of the whole trip, the air was cool and there was not a cloud to be seen. It would have been an ideal day to attempt Mt. Assiniboine, but we preferred to put off the ascent until the morrow, and the whole party walked into the Sunburst Valley, just north of Mt. Marshall, in which lie the pretty little lakes called Sunburst and Cerulean. Rudolph and I detached ourselves and ascended Mt. Marshall, selecting a fancy route just for the sake of a little exercise. The view of Mt. Assiniboine from this little peak is particularly attractive.

On August 16th Mr. Eddy, Rudolph and I left camp at 4.45 on our way to Mt. Assiniboine by the north ridge. At 5.05 we reached the foot of Wedgwood Peak and scrambled up the rocks of a somewhat steep wall, gradually traversing to the left (southeast) and finally reaching the glacier at the north foot of Mt. Assiniboine (7.40-7.55). At 8.40 we were on the lowest rocks of the north ridge and, a few minutes later, stopped twenty minutes for breakfast. Thereupon, we ascended by the northwest face, gradually working on to the north ridge and following the same to the summit. There are two very distinct and almost perpendicular cliffs which

divide the northwest face and the north ridge into distinct sections. These rock walls provide some very pretty climbing. The ridge above the second wall is also quite interesting. The rest of the climbing is, as a rule, quite easy. On this occasion we had, however, to contend with a good deal of ice, which necessitated much step cutting and occasioned much loss of time. It was not until 2.50 that the main summit was reached. At 3.20 we were back on the lower or north summit, which is of rock, rested there until 4.15 and then retraced our steps, reaching the glacier at 8.45. By the time we got on to the steep wall of Wedgwood Peak it was too dark to proceed, and it was necessary for us to bivouac in full view of the enormous camp fire, about 1½ miles down the valley, which our friends kept going far into the night, against our return. The next morning, August 17th, we were back in camp at 6.30 a.m., and since the two main objects of our trip had been achieved, and Mr. Eddy's available time was fast running out, it was decided to break camp that same day and try to reach Banff on the 18th. Accordingly, we left at 5 p.m., riding in the direction of Assiniboine Pass, but turned north to Og Creek, rode past Og Lake into the Valley of the Rocks and down into Golden Valley, where we pitched camp at 6.55 near Big Spring (8 miles). On August 18th we left camp at 8.45, went past Porcupine Camp, with its pole teepee, up to Citadel Pass, on to Simpson summit and down into Healy Creek, stopping at Cold Spring Camp (10 miles) from 12.45 to 2.15 and reaching Banff Springs Hotel, after a long day, at 7.30 p.m. (23 miles from Big Spring). The whole party immediately proceeded to the Sulphur Pool and, after a delightful dinner, took the night train back to Lake Louise, where we arrived about 1 p.m., all very pleased with a most delightful trip.

All of the country above referred to is well shown on sheets 10, 11, 11A, 12 and 13 of the Alberta and British Columbia Boundary Atlas.

THE ASCENT OF MT. MORAN IN THE TETONS

By LeRoy Jeffers

Last summer's brief vacation was spent as usual among the mountains. My wife and I first traversed Mount Mansfield, Vermont, in a storm; after which we viewed the beauties of the Yoho and I enjoyed the northern arête of Mt. Marpole. We journeyed afoot through the uninhabited northern section of Glacier Park, Montana, leaving it by way of Waterton Lakes Park. Entering Yellowstone Park by its scenic eastern approach through Shoshone Canyon, we visited its famous Grand Canyon and geysers, which I had not seen for some years. We also had a brief trip to the Teton Range, south of the Yellowstone. After viewing the Pacific Coast we returned to climb the hills of Lafayette Park, in Maine.

The Tetons of Wyoming are comparatively easy of access in summer, for an auto takes one from Old Faithful Geyser, in the Yellowstone, seventy miles south to the hamlet of Moran on Jackson Lake. Mount Moran (12,100 feet) rises directly opposite on the western shore of the lake, about nine miles distant. A succession of rugged peaks and canyons culminates to the south in the Grand Teton, which towers about 7,000 feet above the valley of the Snake. From Moran its glaciers and fantastic pinnacles loom etherially like some Himalayan giant. Charming lakes nestle along the base of the range and the primeval forest is without trails, save those of bear, moose, elk and deer. Further to the south the naked peaks are of striking form and colour, and all through these mountains there is a most interesting variety of rock. On one peak a narrow chimney springs from base to apex as if it were a giant rope; while up the inner cliffs of Mt. Moran a mighty cathedral buttress of

brown rock climbs to the summit. Although a small range, the Tetons are unique among American mountains. It is proposed to include this region in an enlargement of Yellowstone Park as a fitting climax to its unusual scenery.

On the evening of our arrival we were taken across the lake for a near view of Mt. Moran, which is second in height of the Tetons, and in which we were more interested as the Grand Teton had already been climbed. The superintendent of Yellowstone Park had just viewed the mountain from all sides and reported sheer cliffs which seemed unclimbable. In August, 1917, a party, headed by the head of transportation in the park, had ascended to the eastern glacier, finding it impossible to go farther, and it was reported in the Scientific American of March 30th, 1918, that "the summit has never been attained and probably never will be, as the last 3,000 feet of the mountain are sheer, perpendicular walls of rock." Several eastern alpinists had recently climbed on Moran without satisfactory results. For many years Ben. Sheffield, the local authority on the peak, had hunted sheep on its crags, searching on all sides for a route to its summit. He had concluded that it would be necessary to drive staples into its cliffs.

Warned that all parties had turned back from the walls surrounding the eastern glacier, we landed as far as possible to the north, intending to investigate the northern face. Jackson Lake had recently been dammed and the water level was raised without cutting the timber on its shores. It was now low water and we were greeted with a slimy morass over which there lay a tangle of fallen timber. We dismissed the boat without arrangement for its return, as we intended to view our peak and make our way along the base of the range to settlers far to the south. Camping near the shore that night we made an early start on the morning of August 11, 1919, ascending through thick undergrowth and up long slopes

Photo, U.S. Reclamation Service THE TETON RANGE, WYOMING, U.S.

strewn deep with giant logs. The day grew very hot and the mosquitoes were tireless, so that my 35-pound pack weighed heavily as I struggled towards the cliffs, which were a long distance from the lake. Rising above the timber, we finally found the route impracticable and decided to traverse the slopes of the mountain to the eastern glacier. Climbing in and out of ravines, in order not to lose much elevation, we finally reached the stream, considerably below the glacier. Here we left our sleeping bags under a great rock and ascended to the ice cave at the snout of the glacier. From its cooling portal we viewed the lake that shimmered far below us. The cave is upward of a hundred feet in length and evidence of the movement of the ice was noticeable on the exposed rocks.

Although it was after 1 p.m. and avalanches were descending across the glacier, I decided to traverse its surface in order to secure a better view of the steep snow-filled couloir which leads towards the summit, as seen in illustration facing page 53. My wife decided to return to our bags, where I suggested she might remain until morning if I did not return. We had noted a distant cabin to the south, and I had told her of a camp several miles beyond at the end of Leigh Lake. Ascending the glacier, I threaded and jumped the crevasses, and cautiously crossed its yawning bergschrund, whose vast caverns of blue and green led to unfathomed depths, which I was not anxious to explore. On surmounting the wall above, I was greeted by a gigantic avalanche whose boulders, many tons in weight, came leaping at a terrific speed from the heights. They passed within a few feet of me, threatening to shake me from an insecure foothold. Then the rocks spread out over the route by which it had been necessary to ascend. After going a little farther I concluded that these conditions prevented any fair test of mountaineering skill. A thunderstorm was raging as I descended the glacier and

decided to climb the aiguille at its side. As I worked up the cliffs I studied the walls of the main peak, and, on discovering an opportunity to get on the rocks without reascending the glacier, I hastened to descend and to cross the moraine just below the ice.

It was after 4 p.m., but I realized that this was my only opportunity, for we had insufficient provisions to remain another day. Climbing the wall I found a concealed ravine up which I ascended for many hundred feet to the eastern arête of the mountain. Here were thrilling views of the glacier directly beneath and of vertical cliffs of great height on the north. Snow clouds and rainbows hung over the eastern landscape, and thunderstorms lingered among the distant mountains. After following the ridge for a little way, I traversed the face of the mountain above the glacier, coming at last to a long chimney which led upward into the heart of unclimbable cliffs. The sun had set and twilight reached upward from the valley as I forced my way up the chimney, straddling from side to side in search of hand or foot holds. I had taken my ice axe to give me a longer reach in the absence of a companion, finding it occasionally useful, but in the way when I climbed a beetling crag. Throwing my rucksack above the boulders, which were insecurely lodged in the chimney, I struggled to surmount them in safety or was forced to make short detours on the steep, smooth surface of the surrounding rock, where I hung by friction rather than by any legitimate hold. Earlier in the day this exercise would have been more enjoyable. After many hundred feet the chimney led to a narrow arête with a stupendous drop on the north; while just beyond my progress was barred by a high cliff. I found a way up slanting rocks almost devoid of hand holds where the slightest slip meant an unhindered descent for a great distance. Finally I stood upon a level summit, perhaps 150 feet in length and 25 feet in breadth, which was strewn with loose

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Photo, J. E. Haynes

MT. MORAN, 12,100 FT.

rocks, on which no foot had trod. This is the highest point seen in the illustration opposite. Crossing to the western end of the summit I looked down to a col, possibly 100 feet below, and then across to another summit similar to mine, but a little higher, being surmounted by a huge mass of loose rock. From the lake my summit seemed the higher.

Under any other conditions I should have explored the other summit, but I had reached the limit of what was humanly possible. It was 9 o'clock at night and darkness was upon me. I had hoped for moonlight but was confronted by a storm that was sweeping toward me from the Grand Teton, unhindered by other peaks, for I was far above them all. Already the driving sleet was beating furiously against me as I hastened to pocket samples of the rock and to place my name on a slip of paper in a can over which I piled a few stones. It was only a few moments that I had remained on the summit, taking all in at a glance, and I was now facing the extreme peril of a descent in the dark. Asking for Divine protection, I cautiously felt my way down the dangerous upper cliff. Its evil slope and rare holds, with sleet and wind, made it exceedingly delicate work, so that I was quite encouraged when I reached the head of the chimney. Facing outward I felt for foot and hand holes, gradually solving the reversed problems of my ascent. Occasionally it was impossible to carry my ice axe and I had to drop it ahead in the hope it would lodge in the chimney. Finally, the inevitable occurred and it fell for hundreds of feet, striking fire on its way to the glacier. Possibly it served me well for it hinted that I had descended too far in the dark on cliffs that would soon become impossible. Slowly I climbed again to find my route of ascent, and was rewarded by familiar rocks. On reaching the ravine which was my first key to the mountain the moon aided my rapid progress, but I did not find the right way into the gorge of the glacier. Instead, I continued down

where one would not be eager to ascend by daylight, reaching the stream considerably below the glacier. There was now a troublesome descent over loose rocks and an icy wall to the great rock where I supposed my wife and sleeping bag awaited me. I arrived at 1.30 a.m. to find neither wife nor bag.

I reached the vicinity and called, but no answer reached me save the voice of the stream. Apparently my wife had taken our bags and gone for assistance. As I wished to avoid having to hunt for a rescue party who might start to find me in the morning, I kept on toward the cabin we had seen from the mountain. For hours I battled with thickets of alder and willow along the torrent, leaping from rock to rock and finally travelling down a stream of gigantic white quartz boulders which had torn their way down the mountain. Finally, turning to the south, I climbed a ridge where there was much fallen timber and I had to hang to branches and bushes to keep from dropping over cliffs in the dark. There are no trails in the region save those of bear, moose, elk and deer. Just before light I rested a few minutes and then crossed a morass to the cabin, which I found was deserted. But a welcome note from my wife was pinned to the logs and I learned that she had spent the night there. It was but a few steps to Leigh Lake where I shouted, securing a distant response from my wife, who was struggling through dense jack pine toward the western border of the lake. We then followed the eastern shore to the extreme end of the lake where we found a camp and secured a few minutes' sleep. For almost thirty hours I had taken practically continuous exercise, climbing about 7,000 vertical feet and traversing many miles of difficult country. Starting at the right point under favorable conditions any competent mountaineer will not find Moran excessively difficult—if he knows the route.

By degrees I learned my wife's experiences after I

Photo. A. C. Tate MT MORAN FROM THE NORTH

had left her at the glacier. Descending at first near the stream she was overtaken by the avalanche which I believed had expended its force on the glacier. For nearly twenty minutes by her watch a stream of boulders had crashed past the trembling rock beneath which she was crouching. Although our bags were left far below the glacier we never saw them again, for the avalanche had borne them away. After searching the slope for hundreds of feet without finding the bags, my wife worked her way to the cabin which she reached by dark.

Soon we left for Menor Ferry, across the Snake, where we walked for several weary miles to the main highway and secured a car in which we reached Moran late that night. Not even forty hours with very little sleep can dim my memory of the blue and jagged Tetons rising high against the orange sky. We left for the northern entrance of the Yellowstone by the morning's rosy glow, while the full moon bade us farewell just over the summit of Mount Moran.

THE SPANISH PYRENEES

By Malcolm Bright

[When Mr. Wheeler, the director of the Alpine Club of Canada, whom I am proud to count as a friend of several years' standing, recently requested me to write an article on Spain and the Pyrenees, I felt the utter inadequacy of my position to do so. However, as one of the club's older members, it seemed that here was an opportunity of rendering a service, not merely to the members, but also to the club itself, since, as Mr. Wheeler pointed out, virtually nothing is known in Canada about the range in question. I should like here, before starting on my work, to give my most grateful thanks to the following Spanish gentlemen for their kind help in assisting me in various ways: To Señor Margalet for putting me in touch with the Centre Excursionista; to Señor Ribera, the president of the monutaineering section of the above club, for allowing me to join their expedition to Nuria and Puigmal; to Señor Coll, who acted as guide up Puigmal; to Señor Selles for the loan of the photograph of Nuria and lastly to Señorita Nicolau for much assistance.]

The first question which arises in the minds of many probably is: Where exactly are the Spanish Pyrenees? The following sketch may help to enlighten them. The point to be borne in mind is that just as the Canadian Rockies might be divided into the Alberta and the British Columbia sections, so, too, the Spanish Pyrenees may be divided into those of Cataluña and Arragon. The highest mountains, culminating in Mount Maldito, 10,800 feet (3,318 M), lie in the province of Arragon, whilst those of Cataluña do not reach more than 9,500 feet in Puigmal.*

This range forms a natural barrier between Spain and France, extending most of the distance between the Bay of Biscay and the Gulf of Lyons in the Mediterranean. However, those of us who live in Cataluña and have only two or three days in which to reach, climb and return from the mountains are obliged to be content with the lower plums and leave the bigger ones at the top of the tree to those who can afford the necessary time. It is

*Catalan word meaning, Puig—summit, mal—broad.

a matter of deep regret that through lack of time it was found impossible to visit and climb in the Maldito region of Arragon so as to have included a description of it in this article. As it was, a brief but successful visit was paid to Puigmal, the highest in the Catalan Pyrenees.

Owing to the kindness of the "Centre Excursionista de Cataluña," the largest alpine club in Spain, having some three thousand members in all, I was permitted to join a party of about twenty or thirty others bound for the Catalan Pyrenees, where some intended to go "ski-ing" and others to climb Puigmal.

On the 19th of March, at five o'clock in the morning, whilst all was still dark, and the dawn had not even begun to think of work, a solitary figure clad in gray flannel "breeks," nailed boots and a well-filled ruck-sack might have been observed striding noisily along the tesselated pavements of Barcelona towards the Estacion del Norte, whence the trains begin their slow journey towards the Pyrenees and the French frontier.

On the stroke of six the train pulled out and there punctuality ended. Trains in Spain rank as the next quickest means of transport after walking and driving.

Hour by hour we crept nearer our unseen goal until suddenly, on bursting into the open, after long confinement amongst the foot-hills, the whole range, clothed in majestic white, stood revealed in naked beauty before us. There were the mountains still afar off, raising their proud heads into the pure blue of a Spanish spring morning. And they had every reason to be proud and to look disdainfully upon the world beneath them. Even as a woman knows that her beauty is but ephemeral, that her hair, her eyes, her whole complexion so full of lustre to-day will be faded and dull a short time hence, so do these mountains of Cataluña seem to realize that the snow which crowns them this day in mid-March will have vanished by July, leaving them great masses of barren rock with contemptible grass growing on their

summits. Mountains are human, not senseless conglomerations of rock and snow as some would have us believe, and they yield up their precious fruits to none but worshippers of their mighty peaks.

At Ripoll we changed into a little mountain railway. Another hour or so of puffing and snorting up tiresome gradients and the summer resort of Ribas, some two or three thousand feet above sea level, was reached. Here assemble in the hot months of June, July and August those wealthy souls of Barcelona who can afford to leave the commercial world to take care of itself. Up to this point we had been travellers in comfort; we were now to become sardines in discomfort. Drawn up beside the station were three or four hooded vehicles, not unlike Maltese carts, known throughout Spain as "tartanas." Into each of these were bundled six of the holiday-makers, three on each side, facing each other. There was comfortable room for this number; to put more would be to risk homicide. In entering that abominable contraption my head struck the roof a resounding whack, whereupon I passed a remark in English which it is to be hoped was not understood. Having been in many awkward positions, both physically and mentally, I have yet to find myself in a tighter corner than that in which I spent one hour whilst covering the eight kilometres between Ribas and Queralps. When at length the latter poverty-stricken hamlet was reached, with its tumble-down stone houses built in tiers upon the hillside, all rose together to leave that sardine tin compartment. It is best to gloss over the peculiar incidents relative to the process of egression, of how members became jammed in the doorway and had to be either pulled or pushed (sometimes both) in order to be extricated. Our packs were now loaded into sacks and these strapped on to mules after which began the upward journey to Nuria, where we were to sleep.

There were three ladies in the party and, I regret to

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Photo, M. Bright

THE "SANCTUARIO" OF NURIA
Set in a Pocket of the Mighty Hills

Photo, M. Bright

THE SUMMIT OF PUIGMAL
9,500 Ft. Above Sea Level

say, four or five Germans. These latter, however, in truly arrogant Prussian style, kept strictly to themselves, no small relief to the only Englishman present. The ladies, however, were a most welcome addition and recalled most vividly cherished memories of bygone summer camps with the Canadian Alpine Club.

Up and up we toiled until at length a corner was rounded and we dropped down into a ravine through which a lively stream went splashing along to the valley below. After an hour and a half a halt was called; the half-way mark had been reached. From here on we were obliged to carry our own packs. It is then one regrets having brought those four tins of sardines or the glass jar of jam (we were obliged to carry food for all three days since nothing was obtainable at Nuria). At last, at about five o'clock in the afternoon, on passing a rock with a cross set conspicuously upon it, we left the gorge and immediately afterwards came upon the "sanctuario" of Nuria, consisting of one house and the chapel, set in a pocket of the mighty hills. Everything here was snow and fairly cold, though as yet no wind had sprung up.

The "sanctuario" is a stone building with accommodation for a hundred or more persons. In the summer season it is crowded, and I understand that four in a bed is more than a mere rumour.

After obtaining a bed and room to myself on the top floor, through the roof of which the snow dripped steadily all night long on to the bed, more especially upon the pillow, and most especially my face, I went out to watch "first attempters" on "skis." In the hope of catching a glimpse of Puigmal I climbed half way up a hill whence one commanded a first-class view of everything—except Puigmal. Far away below a dozen or more little black dots sported in the dying evening sun upon the spotless carpet of white. It was a wonderful sensation; all alone, high up, with the sun sinking, and

down there in the valley one's fellow creatures. From time to time one or more would leave for what warmth the only room with a fire in the "sanctuario" had to offer. At last none were left. The sun had gone down. Still I lingered on. It is in such moments and places like these that one's mind becomes tuned to higher matters than the materialistic affairs of the world. There is something after all in the child's thought that the mountain tops reach up to heaven.

Towards the middle of the night a wind took possession of the place. I shut and barred doors and windows, but there was no dodging it. And from then on until the early hours of the morning, sleep became impossible. That wind seemed to penetrate through everything, mattress, blankets and all. At six o'clock I was awakened by a most unearthly thumping and banging far away below. It emanated, as I discovered later, from the two Catalan caretakers, who were only endeavouring to emulate alarm clocks for our benefit. So far as I was concerned it answered admirably, though I heard afterwards that some slept through it. I can only suppose that the altitude had affected their hearing. At 7.30 a party of ten of us set out under the leadership of Señor Coll for the summit of Puigmal, which I was told was easily reached in three hours from Nuria. The snow, which was not deep, was in first-class condition, sufficiently hard to allow of a man's weight upon the crusty surface. A steep climb for the first hour led us to an easy and broad "arête."

And now the wind began to interfere. It lifted the snow off that ridge like a winnowing fan separating chaff from grain. So much did the wind increase in vehemence that one Spanish youth became greatly distressed for his personal safety, apparently fearing he should be mistaken by Boreas for chaff instead of grain. He summoned every available muffler to his aid, though whether as additional warmth or in a mistaken idea that he would

thus weigh more, I do not know. But I do know that we stopped many times on that tiresome ascent to persuade this Spanish embryo climber that he ran no very great risk by continuing with us. I think my brandy flask rather than my words induced him to plod on. Heaven knows it cost nearly the entire contents of the flask to get him to the summit, and of the two I could least afford the companionship of "Martell's Three Star."

Near the summit we passed the Hun "outfit" coming down. They stopped to inform us graciously that there was quite a wind blowing on the summit which had prevented their devoting more than ten minutes to the view. The Huns and I glared at each other, but neither spoke and in a few minutes we had resumed our upward toil. Again the ascent was becoming aggravatingly steep. At this stage another Spaniard began to show signs of failing strength until finally he was abandoned like a ship no longer seaworthy, "and then there were nine." When we arrived at what was summed to be the top, it was only to discover, as is so often the case, that the real summit lay yet a quarter of a mile distant. A few minutes later and we stood upon the highest point.

Puigmal is a mountain of mediocre proportions; it offers no sensational attractions for climbers, it is not even high enough to be considered a serious "grind," yet all this is more than redeemed by the view obtained. I have rarely seen a more interesting panorama from any mountain. Northward, drawn up as though in line of battle ready to oppose all comers, stood the French Pyrenees. Eastward, hemming us in as though jealous lest we might chance to view the sea, rose the Catalan Pyrenees, resplendent in their glistening robes of white. Then as one's eye wandered towards the south, leaving the mountains behind, the Mediterranean flashed with her deep cerulean glory. Far away out of sight over the horizon lay the Balearics, the "Fortunate Isles." A

little more to the south came Mount Tibidabo, the mountain immediately behind Barcelona which, according to local rumour, is the original Mount of Temptation of our Lord. The idea has sprung from the Latin words, "tibi dabo" (to you I will give). But whether there be any connection between this and Satan's words, "All this will I give thee," etc., is to be doubted.

Further to the west rises the mountain of Monseny (5,580 feet), whose eastern arête offers some good rock climbing and has, as far as is known, never been ascended. I attempted it with a friend who had never seen rock before and declared afterwards he never wanted to see it again. Almost before any real difficulty was encountered, the rope had to be put on and brandy administered with the inevitable result that when an awkward piece of rock jutting out from the side had to be traversed the curtain was obliged to be rung down upon the scene. Westwards still more the wonderful mountain of Montserrat raises its serrated, sugar loaf peaks, composed of clay and shingle and absolutely unclimbable, some four thousand feet against the sky. This mountain is of great interest as being supposed to be, firstly, one of the seven wonders of the world, and secondly, the origin of Wagner's legendary "Monsalvat" in "Parsifal," the scene of the Holy Grail. Doubtless there is no truth in any of these things, but life would be colourless without these little splashes of fiction. And then, last of all, northwest, having completed our circle of vision, there rises up the only really true mountain which so far it has been my lot to see in this land of sunshine and bull fights, Mount Pedra Forca. Though a little lower than Puigmal, it offers far more interest to the climber. There is a magnificent chimney starting at the very base of the mountain, forking half way and continuing thus to the summit. So far as can be ascertained, it has never yet been ascended by this, the

Photo, M. Bright

THE CATALAN PYRENEES
Resplendent in Glistening Robes of White

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most difficult route. I hope to make an attempt upon it during this month.

All this time you, reader, have been standing gazing in imagination at the wonderful view, which, even if there were nothing else, would alone make mountain climbing worth the while. But now the bitingly cold wind recalls us to the present and our friend who feared being blown bodily away is not even now feeling too happy. So, after taking photographs of the entire panorama and a group of the "graduating" members, we will breathe a little prayer that neither Puigmal nor any other deserving mountain may be sullied by unworthy feet; for those who love mountains, and who tread their virgin peaks, their holiest of holies, are of a jealous breed and cannot tolerate the thought of any Tom, Dick or Harry floundering up the beloved heights.

We arrived back at Nuria in the early afternoon, where another night was spent, and then the next day home to Barcelona and the ceaseless roar of commercialism, set amidst the horrors of bricks and mortar and clanking tramcars with the leafy glades and snow-covered peaks a freshly verdant memory of the past.

But before this article closes, a few words might well be said on Spain in general as a climber's country, though it is only fair to point out that, having had no opportunity so far of studying mountaineering conditions in other parts of Spain, I have been obliged to rely for my information on the words of others. Speaking very generally, Spain has but little to offer the experienced climber. There are peaks here and there, needles of rock, like the "Watch Tower" in the Rockies, which offer superhuman difficulties and may in the end be set aside as unclimbable, but in the main there is nothing of sufficient difficulty to tempt anyone to undergo the tiresome journey. Still there is no reason why the ice-axe head of anyone who finds himself in Spain should be wrapped up or the rope laid upon the shelf. There are

high mountains in the north and south of Spain. In Andalucia, the country of Cervantes, of "Don Quixote" fame, you may climb to your heart's content up to nigh on eleven thousand feet, and all this within sight of Granada, where the women wear flowers in their hair and sing wonderful songs of old Spain whilst they work. This country is by no means a prairie. So if any climber coming to "España" is in two minds whether to bring or leave his nailed boots let him choose the former course. He will not regret it, and, if he be a fisherman, then the northwest provinces of Galicia and Asturias will claim him for their own with their salmon and trout rivers.

And now the writer would like to be allowed to take this opportunity of repeating an offer made some time ago to Mr. Wheeler, namely, to give all information, advice and help within his power about Spain and her mountains to those members of the Canadian Alpine Club requiring it.

Lastly, if you come to Spain, remember it is a country fifty years behind the times, full of politeness, full of beauty, sunshine and flowers, and full of fleas. Don't try to introduce American methods of hustle or you will not be taken readily to the hearts of a loveable people who have not changed since Armada days in occupying the pre-eminent position of being the most courteous race on earth.

SCIENTIFIC SECTION

THE CONGRESS OF ALPINISM AT MONACO

By Arthur O. Wheeler

In October, 1919, it was announced that a Congress of Alpinism would be held at Monaco from 1st of May to 10th of May, 1920, under the patronage of S.A.S. le Prince de Monaco and the presidency of M. le Baron Gabet, Président du Club Alpin Français, to embrace the great Alpine Clubs and Societies of the Allied Nations.

It was proposed to divide the deliberations of the Congress into three sections, viz.: (1) Glaciology; (2) Cartography, Geodesy, Topography; (3) Scientific Observations of High Mountains, Geology, Meteorology, Physiology, Physics.

The Alpine Club of Canada was invited through its President, Mr. J. D. Patterson, to participate in the said deliberations and to send representatives to the Congress; so your Director proceeded forthwith to prepare a suitable representation that would place before the Congress the outstanding features and magnificent scenic attractions of the Canadian Rocky Mountains and of the high mountain ranges of the Yukon.

It was felt that such representation should be a national one, and, with that end in view, the Canadian Government was approached through Mr. J. B. Harkin, the Commissioner of Dominion Parks, whose deep interest in the mountain regions of Canada is well known. Mr. Harkin responded to the appeal most enthusiastically and secured the consent of the Honourable the Minister

of the Interior to a delegate of the Club being appointed to represent the Canadian Government. Mr. Byron Harmon, of Banff, whose collection of mountain photographs, and superb motion pictures of the Canadian Rockies are so justly celebrated, was duly appointed and he represented the Government of Canada and the Club at the Congress.

In addition, the Club was represented by Mrs. J. W. Henshaw, its Honourary Secretary; by Captain J. P. Farrar, President of the Alpine Club (England), a life member of the Canadian Club; and by Dr. Henry M. Ami, of the British Embassy at Washington, also a member of the Club. To the splendid work of these delegates is due the great success of the Alpine Club of Canada's representation, and sincere thanks are due to their untiring efforts.

With the whole-hearted assistance of Mr. Harmon, your Director was enabled to arrange a magnificent exhibit of photographic enlargements, some 150 in number, of the most striking scenic features of the Canadian Rocky Mountains, comprised chiefly of Mr. Harmon's beautiful pictures and unsurpassed motion films, and of photographs from high altitudes made by the Director during his surveys and mapping of the Rocky Mountain areas for the past twenty years.

A very fine contribution was made by Mr. H. J. Lambart, of the Geodetic Survey of Canada, of coloured panoramic enlargements of the highly glaciated mountain regions of the Yukon and Alaska, obtained while conducting the survey of the Yukon-Alaska Boundary.

A few minor contributions were made by Dr. Chas. Walcott, Secretary of the Smithsonian Institution, by Mr. M. P. Bridgland and by Mr. H. Pollard.

In addition to the above a good exhibit was sent of Topographic Maps, the results of photo-topographic surveys in the Canadian Rockies and in the Yukon-

Alaska Ranges. This was due to the kindly offices of E. Deville, LL.D., Surveyor-General of Canada, who is the originator and promotor of the science of photo-topographic surveying in Canada, and to the kindness of Mr. H. J. Lambart, of the Geodetic Survey. The above enumerated exhibits were duly presented as a gift to the Club Alpin Français at the close of the Congress.

Finally, a number of reports on some of the various subjects under deliberation were prepared by members of the Club and submitted to the Congress. Several of these were suitably illustrated and a few were accompanied by lantern slides, which were projected on a screen during the reading of the reports. All contributions were from authors who are members of the Alpine Club of Canada.

The Canadian representation proved a great success and attracted much attention and commendation from the visitors attending the Congress, particularly so Mr. Harmon's motion films and the collection of enlarged photographic views. Mrs. J. W. Henshaw's beautiful coloured lantern slides, used to illustrate her report on Dominion Mountain Parks, created much favourable comment; as also did a particularly fine set of coloured slides made and loaned by Mrs. Wm. Warren, of Banff, and displayed by Mr. Harmon.

The exhibit was given much prominence and the utmost courtesy and kindness shown by the President and high officials of the Congress to the visiting delegates of the Club. In recognition of the warm-hearted appreciation of our efforts, the Club has had the honour of electing the President of the Congress, M. le Baron Gabet, to Honorary Membership. The splendid success of this great international gathering has amply repaid the labours of the President and his confrères.

A full report by our Honourary Secretary, Mrs. J. W. Henshaw, follows. It sets forth the progress of the

Congress from start to finish and deals with the various features of the Canadian representation.

Below will be found the several reports submitted to the Congress by members of the Alpine Club of Canada. It has been considered appropriate to publish them in full, in order that the valuable information they contain relating to the Canadian Rocky Mountains may be recorded in the annals of the Club through the medium of the Canadian Alpine Journal.

REPORT ON THE ALPINE CONGRESS AT MONACO

HELD FROM MAY 1ST TO MAY 10TH, 1920

By Julia W. Henshaw

The Alpine Congress, attended by a very large number of delegates, was held in the old historical town of Monaco from Saturday, May 1st, to Monday, May 10th, and proved of vastly greater importance and deeper world-wide interest than could reasonably have been anticipated, owing to the years of titanic struggle and post-war upheaval through which we have recently passed.

The number of mountaineering and kindred subjects dealt with in addresses and debates, coupled with the enormous amount of information, both technical and descriptive, contributed by Delegates from all quarters of the globe regarding alpine exploration, climbing, photography and mapping, forest and game reservations, geology, glaciology, flora and fauna, led to much comparative analysis and the dissemination of knowledge both useful and absorbing to those gathered together to discuss these matters as they affect clubs and individuals. Monaco is an ideal spot for the holding of a Congress. It possesses an assembly hall of magnificent proportions and equipment situated in the Oceanographic Museum, which is a monument to the life-work of H.S.H. the Prince of Monaco, the greatest living authority on oceanography, for this museum was built by him to house his marine collections. The surrounding scenery is beautiful; Monaco and Monte Carlo are twin towns, separated only by the picturesque Condamine, or esplanade, bordering the harbour, the former town built upon a great rock jutting out into the sea, and the latter flung against the hillside, its white-walled, red-roofed houses creeping up

from the edge of the Mediterranean towards the heights of the mountains that rise steeply from the shore. In May the climate is perfect, and the country ablaze with wild flowers covering the slopes, and gardens filled with palms and all the glory of the sub-tropical blooms.

The Congress was organized by, and held under the auspices of The French Alpine Club, with H.M. Albert I., King of the Belgians, as Honourary President, and was presided over jointly by H.S.H. The Prince of Monaco and Baron F. Gabet, President of the F.A.C. To it were invited representatives of the Alpine and Mountaineering Clubs of all the Allied Nations, Neutral Nations and the United States of America.

The British Empire was well represented: The Alpine Club and other English Mountaineering Societies, by Captain J. P. Farrar, Mr. J. E. C. Eaton and Mr. Anderson; The Scottish Mountaineering Club and other Scottish Mountaineering Societies, by Mr. N. W. Ling and Mr. Walker; and the Alpine Club of Canada by your Honorary Secretary (Mrs. Henshaw), Mr. Byron Harmon, of Banff, and Dr. Ami, of Menton, the latter a geologist of international fame and a man well versed in the Canadian mountains. The South African Mountaineering Club and The New Zealand Alpine Club were also represented. Other Delegates of interest to us were Mr. Weston, representing The Alpine Club of Japan, and Professor C. E. Fay and Mr. Cooke-Smith, representing many of the Alpine and Mountaineering Clubs of the United States.

The Canadian Delegates were received with the greatest courtesy by Baron Gabet and the French officers in charge of arrangements, when, on their arrival at Monaco, they presented their credentials at the office of the Congress, and having registered, and observed all the necessary formalities, met many of the French, Italian, Belgian, Swiss and Portugese Delegates. The personnel

Photo, Byron Harmon

PART OF MONACO

OCEANOGRAPHIC MUSEUM

GENERAL VIEW OF MONACO

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of the Congress was particularly interesting and delightful. The Prince of Monaco, whose wonderful personality and great gifts of intellect exercised a remarkable influence over the meetings, entertained royally at the Palace, assisted by the Duke and Duchess of Valentinois (his granddaughter and her French husband, formerly Comte Pierre de Polignac, who were recently married at Monaco amidst great public rejoicing), and Canada has no greater admirer in the world than this prince of sportsmen, who has climbed and hunted big game in many lands. The Baron Gabet is a genius, who, out of assorted and diverse elements, created a harmonious and supremely successful Congress. He is a man of force, fluent diction and a keen sense of humour, and we were flattered by his heartwhole appreciation of the Honorary membership in the A.C.C., recently conferred upon him, news of which reached him by cable from Mr. Wheeler during the Congress.

The addresses and deliberations of the Congress were divided into nine sections:

(1) Glaciologie;
(2) Cartographie, Géodesie, Topographie;
(3) Observations Scientifiques en Haute-Montagnes;
(4) Parcs Nationaux;
(5) Économie Alpestre, Flore et Faune;
(6) Refuges et Cabanes;
(7) Clubs Alpins et Sociétés Alpines;
(8) Ski et Sports d'Hiver;
(9) Caravanes Scolaires.

Canada contributed to Sections 1, 2, 5 and 7, and in Section 4, "Parcs Nationaux," only the French and Canadian Delegates took part with some excellent papers and in the discussions that followed.

The exhibits in the Assembly Hall were placed on large screens lining the two sides of the room, and here Canada came first—a very long way in the lead. Six

sections were occupied with the various exhibits of the A.C.C., four of them filled with the beautiful photographic enlargements of Canadian Alpine scenery, climbing, big game and camping, the work of Mr. Byron Harmon, one was filled with topographical maps by Mr. Wheeler and one with photo-topographical surveys prints also by Mr. Wheeler. On the opening day it was impossible to approach Mr. Harmon's photographs, so dense was the admiring crowd in front of them, and throughout the following week one never entered the Assembly Hall without finding a group of people looking at them. The praise bestowed at Monaco upon the A.C.C. exhibits, consisting of photographic-enlargements, maps, moving pictures, coloured lantern slides, scientific papers and illustrated lectures, left nothing to be desired, and must have amply repaid Mr. Wheeler and Mr. Harmon for the task of preparing, collecting and arranging such a magnificent display of the scenic beauties of the Dominion.

The other exhibits in the Assembly Hall were: (1) Photographs, Club Alpin Français; (2) French maps, M. de Cessole; (3) Maps, Japanese Alpine Club; (4) Maps and photographs, U.S. Topographical Surveys; (5) Maps, Algeria; (6) Maps and Photographs, Service Geographique de l'Armée Française.

The Congress was officially opened on May 1st at 4 p.m. by H.S.H. the Prince of Monaco. At the hour appointed the immense hall was filled to overflowing when the royal party entered, the Prince, accompanied by the Duke and Duchess de Valentinois, and followed by his suite, being attended by Baron Gabet and representatives of the leading Alpine Clubs, officers of the French, Belgian and Italian Armies, and one or two noted scientists. The opening addresses of the Prince and Baron Gabet were marked by that cordial and courteous consideration which characterizes the formal speeches of all distinguished foreigners, and we appre-

ciated tremendously the special graciousness of the Prince in making a short speech in English at the conclusion of his address in French, which was, of course, the official language of the Congress. Speeches were also made by M. Dabat, and a few of the principal delegates, among them Mr. Eaton, who included all the Clubs of the British Empire in his excellent address, and, indeed, we were most delighted to find that he was at all times willing to assist the Delegates from the far distant parts of the Empire in any way in his power. That same evening a gala performance was given at the State Theatre, to which all the members of Congress were bidden by H.S.H. the Prince of Monaco.

Sunday, May 2nd, was taken up with papers and debates on forests and waterways, and an expedition to the Brêche de Gorbio and Mount Baudon. At the conclusion of the afternoon session, I gave a short illustrated lecture on the Rockies, followed by an exhibition of Mr. Harmon's moving pictures. Both were received with tremendous enthusiasm, and in a speech of glowing appreciation Baron Gabet asked that the lectures and pictures be repeated several times during the ensuing week.

Each day the procedure was much the same, the mornings and afternoons being devoted to addresses and debates, and the last session each afternoon terminating with an illustrated lecture. Monday, May 3rd, was devoted to geology, glaciology and geodosy. The illustrated lecture that day was on the Himalayas, by Dr. Jacot-Guillarmod. Tuesday, May 4th, introduced the famous Dr. Paul Mercanton to the members; he is one of the greatest living authorities on glaciology, and gave a most interesting paper on "Forty Years of Glacial Observations of the Rhone Glacier." Flora, fauna and topography were also discussed. Later I gave an address on the flora and fauna of the Rocky Mountains, illustrated with hand-coloured lantern slides, and Mr. Harmon

showed another set of moving pictures of The Mount Robson and Assiniboine regions. The excursion that day was to the Gorges du Loup and Cap Antibes.

On Wednesday, May 5th, the excursion was to the Col de Castillon and St. Agnes, a truly wonderful mountain trip. M. Ferrand read the paper prepared by Messrs. Mumm and Eaton, on "The Alpine Club," which attracted much attention, and the subjects discussed were National Parks and general mountaineering topics. The lecture of the day was given by Mr. Weston on "The Mountains of Japan," and this was illustrated with very beautiful coloured lantern slides. Thursday, May 6th, was devoted to the consideration of aviation in relation to reconnaissance of the mountains, and the topic of winter sports. Dr. Ami read a paper prepared by Mr. Lambart, of Ottawa, and this was illustrated with some fine slides. M. Ferrand gave a very interesting illustrated lecture on "Cabins and Huts in the Alps."

Friday, May 7th, was marked by a wonderful excursion to Sospel, which many members availed themselves of. Dr. Jacot-Guillermod read excerpts from a paper by Dr. Kellas on "The Possibility of Attaining the Summit of Mt. Everest," and the illustrated lecture was given by your Honourary Secretary on the "National Parks of Canada," my address being based on the notes prepared in Ottawa by Mr. Matheson.

Saturday, May 8th, was spent in the consideration of "Types of Migration in the Alps," "Corsica," and "Types of Roofs in France." A pleasant reception was given by the Mayor of Monaco to all members of Congress in the afternoon, and after the reception Mr. Harmon gave an exhibition of his films before a very large audience. Sunday, May 9th, saw practically the end of the Congress, and was marked by a delightful luncheon at the Golf Club on the top of the mountain near La Turbie, following an ascent of Mont Agel. On this occasion

felicitous speeches were made both by our hosts, the officials of the French Alpine Club, and by some of our Delegates, notably Captain Farrar, who ably substantiated the entente begun by Mr. Eaton on the opening day of the Congress.

So much for the technical scope of the Congress, rich in educative value, and the compiled records of which will undoubtedly prove a text-work of great use; while woven throughout this woof of learning there ran a golden thread of purely sentimental value that caught at the imagination of everyone present; a thread binding closely together the Delegates of different nations, since alpining and mountain science—like art, literature and music—know neither country nor boundary, but belong to all mankind. Kingdoms have flourished on sentiment, and great deeds have sprung from its strength—learning interests its devotees—but the paramount influence that pervaded the Congress was the same which holds the alpinist in its grasp and leads to the mountain tops—the deep abiding love of Nature—a sentiment which outlives books, and without which all learning is as a tinkling cymbal. It is to be hoped that the bonds tightened between the Alpine Club of Canada and the European Clubs at the Congress will remain taut as time goes on, and lead to more and closer comradeship in matters appertaining to the mountains, for the aims and objects of all Alpine Clubs are the same, and to our fresh strength of the New World we may with advantage bring the tried standards of the older civilization.

REPORT SUBMITTED
TO
THE ALPINE CONGRESS AT MONACO
BY
THE ALPINE CLUB OF CANADA

THE APPLICATION OF PHOTOGRAPHY TO THE MAPPING OF THE CANADIAN ROCKY MOUNTAINS

By A. O. Wheeler

Introduction

In so far as the science of Iconometry or Phototopography, as it is known to us in Canada, applies to the survey and mapping of Canadian mountain areas, its origin is due to the investigations of the late Colonel Ami Laussedat, member of the Institute of France and Honorary Director of the Conservatoire National des Arts et Métiers, the originator of the method as far back as 1849, whose original and instructive publications, entitled "La Métro-photographie," presented to the French Society of Photography, and "Recherches sur Les Instruments, Les Méthodes et Le Dessin Topographiques," 1901-1903, are exhaustive works upon the subject. Wherever photographic surveys are now made they are executed by the application of the principles laid down by Laussedat.

In Italy the celebrated engineer Porro, who was acquainted with Laussedat and knew his work, made experiments in this direction. In 1875 and 1876 further experiments were made by Lieutenant Manzi Michele.

The initiation of the ordnance photographic surveys of the present day are due to Major Annibale Ferrero, Director of the Geographical Military Institute. The very remarkable work of the Institute is due to L. Pio Paganini and his able staff of assistants and collaborators.

In Canada, Edouard Deville, LL.D., Surveyor-General of the Dominion from 1884 to the present day, is the father of the science. He was a warm friend of Colonel Laussedat and received assistance from him in his elaboration of the Canadian methods. Dr. Deville's valuable and concise work, entitled "Photographic Surveying," published in 1895, is a scientific classic. It not only treats fully the theory of the subject and methods employed upon Canadian surveys, but briefly reviews its conception and progress and the methods employed elsewhere.

Application in Canada

It is in Canada that the method has received its most extensive application, and its usefulness was readily appreciated by Dr. Deville when it became necessary to extend the Dominion Government surveys to mountain areas of which topographical maps were required.

The method has been applied in many directions and for various purposes where the highly accentuated contours of the terrain rendered the application of ordinary methods of survey too laborious and expensive, or else altogether impracticable.

The first surveys were made of a portion of the Main Range of the Canadian Rockies, along the line of the Canadian Pacific Railway in 1886, by J. J. McArthur, D.L.S., and W. S. Drewry, D.L.S. (members of the Alpine Club of Canada), under Dr. Deville's supervision.

The method was used for topographical delineation in conjunction with the survey of the 49th parallel of

latitude, the boundary between Canada and the United States, under the superintendence of the late Dr. W. F. King, His Britannic Majesty's Boundary Commissioner for the Dominion of Canada, and was later used for the survey of the boundary between Alaska and the Yukon, where it lies amidst the mountains of the coast and St. Elias Ranges, and of the 141st meridian of longitude, constituting that boundary northward to the Arctic Ocean through the mountain regions of the Yukon and Alaska, under the superintendence of Mr. J. J. McArthur, Dr. King's successor.

In 1895 the method was applied in connection with irrigation surveys to map the mountain foothill catchment area adjacent to the great western prairies, and the surveys were made by the writer.

In 1900 a photographic survey was made, by the writer, of the Crowsnest coal area, and in 1901-2 of the Selkirk Mountains along the line of the Canadian Pacific Railway. Until 1907 the writer was engaged upon photographic surveys in the Main Range, covering areas adjacent to the said railway which were in demand for public tourist resorts and which constituted parts of the Rocky Mountains and Yoho Parks; also for jurisdiction purposes.

In 1911 an expedition was sent by the Alpine Club of Canada, in charge of the writer, to explore the Rainbow Mountains and a considerable area of the Mt. Robson region was mapped by photo-topography.

Since then a number of mountain parks, noticeably Jasper Park and Waterton Park, and several forest reserves have been mapped by M. P. Bridgland, D.L.S., and numerous reconnaissance surveys have been made by the Geological Survey of Canada, and many localities mapped with satisfactory results for the representation of geologic facts.

Photographic surveys are now being made by the British Columbia Government of Western Canada, under R. D. McCaw, B.C.L.S., (member of the Alpine Club of Canada), to ascertain and map the distribution of forest areas and for other purposes.

Since 1913 the writer has been engaged upon the survey of the boundary between the provinces of Alberta and British Columbia of the Dominion of Canada, as the Commissioner representing British Columbia. He has had special charge of the mapping of the areas surveyed, which has been done for the most part by photo-topography. It will be readily understood why this method was adopted when it is known that for more than half of its length the boundary is the watershed line of the Main Range of the Rocky Mountains and lies along its very apex, passing over many of the highest summits.

Approximately an area of forty thousand square miles has been surveyed and mapped to date in Canada by photo-topographic methods, and the utility of the method is so well established that it is being more and more extended by the various Government Survey Departments to the roughly accentuated mountainous areas with which they have to deal concerning the vast economic resources of the Dominion.

In the exhibit of photo-topographical maps made by the Alpine Club of Canada at this Congress, samples of a number of the various map results referred to above may be seen.

Uses of the Method

It is not the writer's intention to go into the theory of the science of photo-topography and the various perspective and geometric constructions it involves, or to record the various applications of the science made by other countries. It is merely his desire to refer briefly to the many uses to which it may be put, not alone by

the map maker but by the geographer, explorer, geologist and alpine enthusiast.

Appended to this article are notes upon the Canadian instrumental equipment and method of procedure for field work and map construction, prepared by M. P. Bridgland, D.L.S., and A. J. Campbell, D.L.S. (members of the Alpine Club of Canada), both of whom were the writer's associates during many years of his surveys. Mr. Bridgland has now for a number of years been in charge of photo-topographic surveys of the Dominion mountain parks and of the mountain forest reserves. Mr. Campbell has been associated with the writer since 1913 upon the Interprovincial Boundary Survey between Alberta and British Columbia and is still so associated. They, therefore, write with authority.

The method is best adapted to boldly accentuated areas, such as are found in all mountainous regions, and can be applied no matter how exalted the area may be, depending only upon the ability of the operators to reach the elevated positions used as photographic stations with their instruments—camera and mountain theodolite—and while there to experience weather conditions suitable for photography.

The range of country that can be so mapped is wide and extends from rugged, rocky mountains, clad with ice and snow, to hilly and rolling country, more generally described under the term of "foothills." Mapping of such foothill country can be consummated provided there is sufficient contrast in the aspect of the landscape to give differentiation of features in the photographs.

It can be employed with rapidity and cheapness for topographical delineation where surveys by the ordinary methods would be very costly or altogether out of the question. While adapted to all classes of country where there are sufficiently defined contours and contrast of

features to show clearly in the photographs, the method is best suited to the delineation of rugged snow-clad mountain country, with wide snowfields, wildly tumbling icefalls, precipitous rock walls, dense forests, rushing torrents and deep, timbered valleys, where access is difficult and ordinary methods of survey impossible.

The photographic method is especially suited to geographic exploration and quick reconnaissance surveys of required areas. Surveys of such character may be carried up the valleys of main waterways and extended over important lake basins while an exploration party, with its attendant impedimenta, is slowly making headway along the valley bottom. Commanding points bounding the margins of the valleys may be occupied by the camera and theodolite and, by such means, a quick triangulation carried up or down, the photographs gathering all requisite topographical information more accurately than by actual investigation. It is, however, essential to have either a starting point or a closing point that is of known position and altitude, but that is equally necessary for any other method.

Similarly, a lake basin (see notes by Bridgland and Campbell) or any desired area adjacent to a base line, a railway line, a boundary line or any other line of known position and altitude that has been, or is being, surveyed with accuracy can be mapped, provided there are points of sufficient altitude bounding or within the area to display it in detail to the camera.

Most particularly is the method of interest to geographers, geologists and the large number of persons who are interested in mountain regions wrapped in ice and snow, who come to them annually to study many branches of natural science, not omitting artists and photographers.

By it can be obtained the height of surrounding peaks (to which a reference is made later); the length, width

and fall of glaciers, as well as a record of their action and effect; the drop of waterfalls; the depth of precipices; the dip, thickness and trend of strata; the area of snow-fields, lakes, etc; the sinuosity of streams; and the processes employed by Nature in carving out the terrain from the original upland.

The photographs furnish permanent records from which to study at one's ease the country or feature portrayed, when far away from it. From such photographs by this method can be obtained a large amount of most valuable information bearing upon mineral and forest wealth, water powers, routes for railways and roads, reservoirs for water storage and power and light plants, water supply for irrigation and city purposes; even towns and villages can be mapped if seen from heights above them.

Principles and Operation

The position and relative elevations of the camera stations are ascertained by the ordinary methods of a trigonometric survey carried to a greater or less degree of refinement. The accuracy and detail of the mapping is dependent upon the precision of the base work, the number of camera stations and the scales of the map. The method is similar to that of the plane-table, but has some very strong advantages. With the plane-table much of the plotting is done in the field, with the camera altogether in the office; with the plane-table you can occupy but one station at a time, but with the camera the views from both stations lie on the table before you. These are very important factors in the identification of points, as will be readily appreciated by those who know the variable conditions of mountain climate—the high winds and extremes of heat and cold to which it is subject.

On the other hand the most perfect photographs give but a comparatively weak representation of Nature's

Mt. Columbia, 12,294 ft. Mt. Tsar, 11,232 ft.
Mt. King Edward, 11,400 ft.

Photo, A. O. Wheeler

COUNTRY SUITED TO A PHOTOGRAPHIC SURVEY

Head of West Branch of Athabaska River

Photo, A. O. Wheeler

A LAKE BASIN AND ALONG THE LINE OF A RAILWAY

Yellowhead Lake and the G.T.P. and C.N.Rys. on opposite sides of it

contrasts, and the delicate inflections of light and shadow are much impaired by transition through the camera lens and reproduction on the best sensitized plates.

Two persons alone can conduct the camera and instrumental work at a station, and one may be a porter to help carry the instruments. It is better to have three in case of an accident and to accelerate operations.

It may be thought that the sides of mountain valleys are often too precipitous to permit of the camera seeing into them, on account of the fact that the photograph plate must be vertical when exposed. It is seldom, however, that stations cannot be found to give a raking view.

A strong point is that the altitude is carried by angles of elevation and depression from point to point, read back and forth between the stations occupied, and all other altitudes of points are deduced direct from the photographs. This is in comparison with altitudes obtained by reading of the aneroid or mercurial barometer, or by the hypsometer, and gives more accurate results, for the angles are not dependent upon atmospheric conditions in the same way and require no series of simultaneous readings with stationary instruments elsewhere.

To the alpine man, who is pre-eminently an explorer, the photographic method should appeal. By it he can readily obtain the details of a particular mountain mass and its incumbent snowfields and glaciers, and can portray the various routes of ascent. He can map the forefoot of a glacier periodically and thus record the changes that have taken place (see map of the forefoot of the Yoho Glacier obtained by photo-topography, attached hereto). He can ascertain fairly approximate elevations for distant peaks and can fix their position with a relative degree of accuracy.

Those who have a knowledge of the mountains of the Canadian Rockies will recognize the names, Mt. Columbia, Mt. Bryce, Mt. Lyell, Mt. Forbes and Mt. Chancellor. The initial ascents of the first three were made by Sir James Outram and the guide Christian Kaufmann in 1902 and of Mt. Forbes with associates also in 1902. Mt. Chancellor was first ascended by Outram and associates in 1901 with the guide Christian Häsler.

In 1901-1902, while conducting a photo-topographical survey of the Selkirk Range for the Canadian Government, the writer had occasion to take a number of views from commanding Selkirk peaks in which Mts. Columbia, Bryce, Lyell, Forbes and Chancellor, many miles distant, were identified. Having plotted the Selkirk triangulation, it was attempted, as a matter of experiment, to compute from the photographs the altitudes above sea-level of the five mountains named, which at that time were unknown.

The methods employed were the same as those used in the ordinary reduction of the altitudes of points selected in photographs to enable contours to be drawn for the formation of a topographical map.

The positions of the several peaks were first laid down from the photographs and the distance scaled. The altitudes were next computed and a correction for curvature and refraction applied.

In explanation it may be said that the altitude of any point in a photograph, taken with a specially constructed Canadian topographical survey camera, is dependent upon the relations existing between the distance such point is from the camera station, the focal length of the photograph (which is generally an enlargement from the negative of the plate used in the field) and the height of such point above and below the horizon plane of the station occupied.

The results in this case seemed to provide altitudes for the peaks named that would be a close approximation to the truth:—

The Mt. Columbia computation, made from views at four different stations, gave a mean of 12,740 feet above sea-level, with a range of 261 feet between the extreme results.

Mt. Bryce was a mean of results at six stations and the computed altitude 11,686 feet, with a range of 235 feet.

Mt. Lyell, computed from four stations, showed a mean altitude of 11,463 feet, with a range of 271 feet.

Mt. Forbes, also from four stations, a mean altitude of 12,075 feet, with a range of 355 feet.

Mt. Chancellor, from four stations, gave a result of 10,751 feet, with a range of 44 feet.

In each case the extreme distance apart of the computing stations was a little over eighteen miles. The average distances from the stations occupied were: Mt. Columbia 62 miles, Mt. Bryce 55 miles, Mt. Lyell 52 miles, Mt. Forbes 50 miles and Mt. Chancellor 45 miles.

From more precise surveys all five mountains have been given an accepted altitude above sea level that is correct within narrow limits. The comparative results are shown in the following table:—

Mountain	From Selkirk Views	Established Altitude	Difference
Mt. Columbia	12,740 feet	12,294 feet	446 feet
Mt. Bryce	11,686 feet	11,507 feet	179 feet
Mt. Lyell	11,463 feet	11,495 feet	32 feet
Mt. Forbes	12,075 feet	11,902 feet	173 feet
Mt. Chancellor	10,751 feet	10,780 feet	29 feet

In the case of Mt. Chancellor the peak is almost opposite the centre of the eighteen-mile base and the

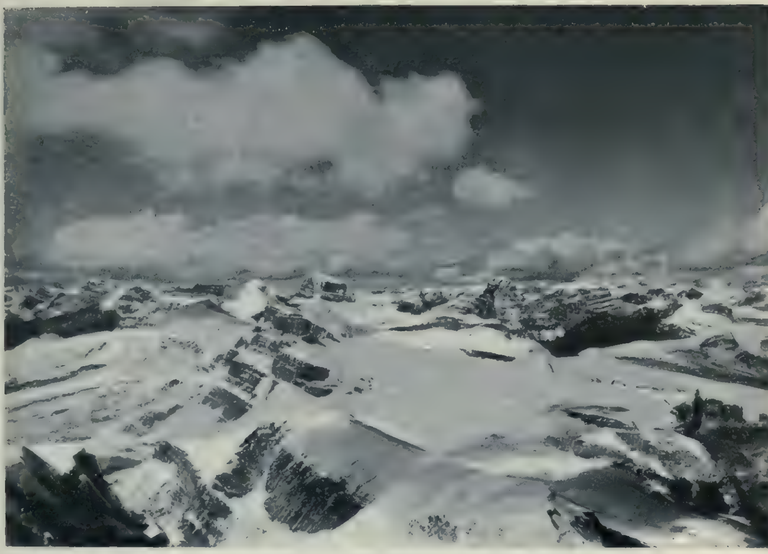
lines of sight from the stations used made a sharp intersection and so located the position closely. In the other cases the lines of sight made an oblique intersection and located the position less accurately with less accurate results for altitude. For Columbia the intersection was most oblique and the distance—62 miles—greatest. With medium distances and sharp intersections of the lines of sight the results will give close approximations to the truth.

Map Construction

The maps of the Canadian photo-topographic surveys are shown by contour lines of from 100 feet to 250 feet altitude interval apart. Plotting the contours and drawing the map is the most tedious stage of the method. The time required depends to a large extent upon the scale and contour interval employed and upon the character of the country. Mountain regions, where the features are massive and well defined, can be more rapidly delineated than hilly country where the contrasts are not so sharp and the contours less well defined.

It is a most interesting process: A view from a station at the summit of a high peak shows a chaos of mountain-tops, reaching into the far distance. As the mapping proceeds all the relative features fall into place: valleys align themselves; streams wind along their bottoms; lakes are outlined; and mountains stand out in their isolated masses, separated by wide snowfields and curving glaciers.

The office work occupies at least twice the time of the work in the field. To offset this the field work, which is most expensive, can be done in half the time, or less, than would be required by any other method. In three months of fair weather, from 500 to 1,000 square miles of country can be mapped by one party, according to the degree of accuracy and detail desired.



Photo, A. O. Wheeler

A CHAOS OF MOUNTAIN TOPS
Looking North From Chaba Pk. at Head of Chaba River

Photo, A. O. Wheeler

FEATURES FALL INTO PLACE
Looking South From Chaba Pk. at Head of Chaba River

The following notes by Messrs Bridgland and Campbell give a synopsis of the instruments used, field-work and map construction of Canadian photo-topographical surveys. With minor variations the instruments used are the same for the several survey departments employing the method.

NOTES BY M. P. BRIDGLAND, D.L.S., AND A. J. CAMPBELL, D.L.S.

Instruments

On Canadian photographic surveys the essential instruments are a camera and a small transit-theodolite. These instruments are of the simplest possible form. In this respect they show a marked contrast to the complicated designs of most European instruments.

The camera consists of an oblong metal box open at one end and fitted into a strong outer wooden case. The metal box carries the lens and two sets of cross levels, which may be read through openings in the outer case. Inside the box there are two sets of diaphragms, and a shade is placed over the lens, when a plate is exposed, in order to eliminate all superfluous light. The instrument stands on a three-screw base, identical with that of the transit-theodolite so that the same tripod may be used for both. The camera may be used with the long side either horizontal or vertical. In the horizontal position the lens has a field of about 51 degrees and in the vertical of about 36 degrees. The extent of the field is shown by lines ruled on the case. The size of the plate is 4¾ by 6½ inches. The carrying case is made to hold the camera and twelve single plate holders. The total weight of the case with the camera and twelve plates is about twenty pounds.

The transit-theodolite is a light instrument of the ordinary pattern, made by Troughton & Simms, London,

with three-inch horizontal and vertical circles reading to minutes. The tripod has extension legs, three feet four inches long when extended and twenty inches long when closed. When in use a bag is suspended between the legs and filled with stones, and the legs and bag are further blocked with stones so that it is rigid in any wind. For packing, the head is taken off and placed in the transit box, while the legs are placed in a canvas case designed to hold the box and the legs. The canvas case is fitted with shoulder straps for carrying. The total weight of the instrument is about fifteen pounds.

Owing to the excessive contrasts of alpine scenery, ranging from snow in sunlight to deep and heavily timbered valleys in shadow, it would be impossible to get good photographs with an ordinary camera lens. Moreover, there is always a certain amount of diffused light which tends to obscure the distant details. The remedy for the former is a plate having a great latitude of exposure, and for the latter an orthochromatic plate and a yellow screen. A few years ago the Canadian cameras were fitted with the Tessar lenses and Wratten and Wainwright "G" filters. Along with these Wratten and Wainwright "Panchromatic plates" were used and have been used since. They give very satisfactory results.

System of Control

The system of control may vary from a precise triangulation, followed by the occupation of several intermediate photographic stations, to a reconnaissance survey, where the triangulation and the photography are carried on at the same time. As speed is of primary importance in the survey of the Canadian Rockies, owing to the extensive area to be surveyed and the difficulty of access, the latter is the method most generally employed. When possible some of the outstanding stations are re-occupied towards the end of the season.

This greatly improves the triangulation and aids materially in fixing the position of the stations.

By this method, to fix a station in position, it is necessary to have readings on four or more outside fixed points or to have readings on two outside fixed points and one reading from an outside fixed point.

The position of a station may be computed or may be plotted graphically. For the latter the readings on the outside fixed points are plotted on tracing paper and lines are drawn in the direction obtained. The paper is then placed on the plan and shifted around until each line passes through the station to which it belongs. The point from which the lines radiate is now the position of the station to be fixed and may be pricked through on the plan. If readings from outside fixed points have been obtained these are laid down and a similar method followed with the readings from the station. More accurate results may be obtained through this method than is readily apparent.

Field Work

Once in the field the first problem that confronts the photo-topographical surveyor is the choosing of suitable stations. Stations which give the most comprehensive views of the surrounding country are necessary and it is a matter requiring experience to know when enough stations have been occupied to give a good delineation of the country mapped.

The operator must bear constantly in mind that all the country to be mapped must be seen from at least two points which subtend angles great enough to give satisfactory intersections and not too great to permit of easy recognition of the same feature as they appear from each station.

The higher peaks are not always the best to occupy. In photographs taken from a very high station the surrounding country may appear dwarfed and the details do not show up as well as in those taken from a moderate elevation. Nevertheless, stations on the higher peaks are necessary for the better production of the triangulation. It follows that a combination of the two will give the best results. It must be remembered that the higher the peak, the longer the ascent is likely to take, and the greater the likelihood of encountering sudden storms. Thus it is possible to make use of a day on which the weather is doubtful, or more than doubtful, by occupying a station of low altitude instead of one of high altitude.

The first part of the day's work is the ascent to the station to be occupied, during which the party may encounter all the difficulties and experience all the *delights* so well known to mountaineers and to those who, like topographical surveyors, *only* climb mountains. At the beginning of the season the delights are paramount but towards the end the troubles assume larger proportions. It is as possible to become satiated with mountains as with anything else. The summit having been reached a suitable place is chosen from which to take the photographs and read the azimuths. It is not often possible that all the views required can be taken from a single camera station; usually one or more sub-stations on different parts of the peak are required. As a rule these may be located by reading angles on them from the central point and measuring the distance with a light tape. It is customary to take enough views from each peak to cover the complete circuit of the horizon. Those taken at the different sub-stations join or overlap those at the main station.

The general practice is to expose the plates from left to right, allowing a generous overlap between each plate

for the sake of contingruity. This overlapping is also done to eliminate, in so far as is possible, the distortion in the print, which has been found, in practice, to be greatest at the edges. Another reason for the overlap, and an important one, is to have common points on adjoining views. Such points serve as a check in plotting the direction of the principal lines of the views. Views are taken in either the horizontal or vertical position of the camera, whichever covers the particular section being photographed to the better advantage.

Orient points, as they are called, should be noted as the views are being taken. Any well defined point or any established station on a well defined peak will serve as an orient. Angles, horizontal and vertical, are read on these orients. All horizontal angles are read from a previously established point of reference. From horizontal angles the direction of the orient points are laid down on the plan and from them the direction of the principal lines of the views are obtained. One such point is necessary in each view; two are preferable. The vertical angles serve to check the horizon lines of the views should there be any trouble in the office when drawing the map.

The plates are all given numbers. These numbers are marked directly on the plates, using a very soft pencil, when they are being placed in the plate holders. This is done in a dark tent. On being exposed, the plate numbers, the time of day, the condition of the light and the length of the exposure are recorded along with the mention of some particular feature in the view or some description that will lead to easy identification in the office and permit of arranging the enlargements in groups according to their stations.

The views having been taken the transit-theodolite is set up at the main station and the azimuths read and recorded. Azimuths are read on all stations in sight, on

the orient points of the views, on any high mountains desired, camera stations on the same peaks and on any other points that may prove of aid or of interest. The angle of elevation or depression in each case is also read and recorded. At the sub-stations it is often necessary to read a number of angles in order to provide orient points for the views taken at them.

Finally, a cairn built of stones is erected, generally at the central point. They range in height from four to seven feet, depending on the importance placed on the station as a triangulation point. These cairns can be seen and identified for many miles by the aid of the telescope on the transit-theodolite.

The party then descend the mountain to the camp with the satisfied feeling of having accomplished a good day's work.

The exposed plates are now developed and bromide enlargements, approximately 10 inches by 14 inches in size, made for plotting purposes.

Office Work

The plotting of the triangulation and the fixing of the position of the stations on the plan is the first operation in the office. The positions of all other points on which a sufficient number of readings have been taken in the field are also plotted.

Canadian topographical maps are usually referred to sea level as a datum. This is done by reference to some point or points on a railroad of which such altitude is known and the altitude is carried forward from station to station throughout the survey. In surveys in isolated sections the initial altitude would, necessarily, have to be obtained by some other method, but it is usually possible to refer the altitude to some point on a railway

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Photo, A. O. Wheeler CAIRN AT A SURVEY STATION

or to some point or points of former surveys of which the altitude is known and has been derived from that source.

In calculating the altitude of a station all angles of elevation or depression from that station on points of known altitude are used, as are all angles from points of known altitude on the station. Corrections for curvature and refraction are applied where necessary and the mean result of all the readings taken. In this manner very accurate results have been obtained.

The positions of the principal and horizon lines of the photographs, which have been determined by testing the cameras in the field, are shown by v-shaped notches in the edges of the metal camera box against which the plate presses, and appear on all the views taken with it. The lines are ruled on the plotting enlargements by drawing from notch to notch. The traces of the principal line and of the picture plane for each view are then laid down on the plan. A simple instrument has been devised by R. D. McCaw, D.L.S., which makes it possible to do this very rapidly. Views from different stations showing the same country are next selected. Sufficient points are identified on each of two corresponding views taken from the different stations to indicate clearly the topography of the country. These points are plotted on the plan and their altitudes computed from the photographs and from their position on the plan. Using the points as a guide, and with the photographs in front of him, the topographer is able to draw in his contours with an accuracy dependent chiefly on the number of points plotted and on the scale of the plan.

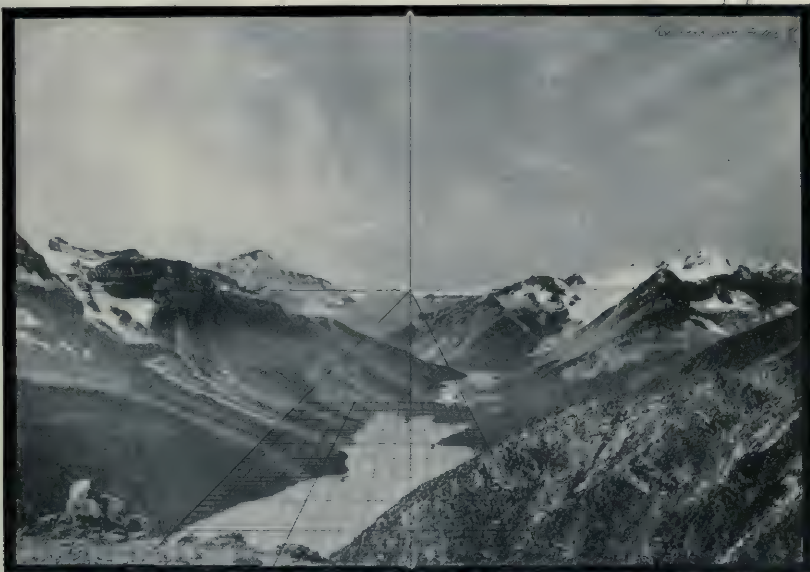
Figures 1 and 2 represent views from two stations shown as A and B in Figure 4. The principal and horizon lines are shown on these views and points 1 to 8 have been identified to illustrate the method of plotting.

In Figure 4, a a and b b, a'a' and b'b' are the traces of the picture planes and principal lines for Figures 1 and 2, the distance from the station to the picture plane being equal to the focal length. The distances of the identified points from the principal lines of the photographs are taken off on a strip of paper, a separate strip being used for each view. These strips are then placed on the traces on their respective views, as shown by c c and c'c' in Figure 4. The line of sight to any point is then given by drawing a straight line from the station to the projection of the point as shown on the strip. The intersection of the two lines of sight is the position of the point. By inserting needles at A and B, and using fine silk threads or hairs, instead of actually drawing lines on the plan from each station, the intersections may be determined very rapidly.

The elevations of the points are taken out by means of the instrument shown in Figure 5, which was originally devised by Messrs. D. B. Dowling and H. Matheson of the Canadian Geological Survey. The arms M and N are of brass, fastened rigidly together. P and Q are sliding arms, moving on the arm M. A swinging arm, R, revolves about the centre B. P and R are made of transparent celluloid and on R a fine line (r r) is ruled, radiating from the centre B. The arm Q carries a scale corresponding to the scale of the map. The instrument must be made accurately so that, when the line r r is over the line s, the reading of the scale will be constant when Q is moved along the arm M. The corrections for curvature and refraction for the different distances may be marked on the arm R to any degree of accuracy desired. In Figure 5, zones are marked, giving corrections of 10 feet.

When using this instrument the centre B is placed over the station and the arm P is placed so that the edge coincides with the trace of the picture plane, b b, the line

94a



Photo, A. O. Wheeler

ILLUSTRATING METHOD OF SQUARES

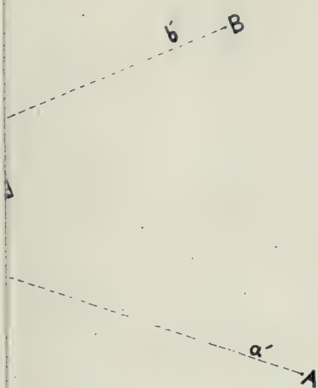
From Fortress Lake Centre Station (B in Fig. 4)

Fig. 2

Photo, A. O. Wheeler

ILLUSTRATING METHOD OF SQUARES

From Fortress Lake South Station (A in Fig. 4)



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s falling on the principal line. The instrument is then held in place by heavy paper weights. The distances of the points above or below the horizon line, as shown on the view, are taken off on a strip of paper and the strip is then placed on P, as shown in the diagram, and held in position by the clips p p. The scale is now set to read the altitude of the station, when the line r r coincides with s. To obtain the altitude of the point 6 the arm Q is moved to the point plotted and R is moved so that r r passes through 6 as shown on the strip. The altitude of the point is now read directly off the scale and the corrections, as shown on the arm R, applied. To avoid errors the altitude of each point is taken from two views and the mean of the two elevations is used.

Relatively level topographical features, such as swamps, lakes and rivers with a comparatively small fall are plotted by means of the perspectometer. This consists of the perspective of a series of squares drawn on glass, having the distance line equal to the focal length of the photograph. The projection of the squares is laid down on the plan, the size of the square being dependent on the difference in altitude of the feature and the station. The perspectometer is placed in its proper position on the photograph and the outline of the feature drawn in, square by square. The method is illustrated in Figures 2 and 4, showing the plotting of part of Fortress Lake and the remaining part of the lake may be plotted in a similar manner from other views. Figure 3 is a view of the whole lake. The continental watershed between the Arctic and Pacific Oceans, that is to say, the boundary between the provinces of Alberta and British Columbia lies between the end of the lake and the river in the foreground. The lake lies in British Columbia and is drained by a tributary of the Columbia River, flowing to the Pacific. The river shown in the foreground is named the Chaba and is a branch of the Athabaska River, flowing to the Arctic.

The drawing of the contour and other lines that delineate the topographical features on the map is dependent upon the position and altitude of the points laid down, and they should be selected on the photographs with an eye to obtaining the best possible delineation. Skill in selecting these is only attained by practice.

There are many other geometrical and perspective constructions that assist the procedure but they are more appropriate to a technical work on the subject than to a general outline such as is here given.

On exhibit at the congress are a number of photographic enlargements of views taken by the writer and his associates while on the surveys above referred to. There are also a number of topographical maps, made by the process of photo-topography. An inspection of these will assist a fuller understanding of the subject.

It is difficult in so short a time to give a comprehensive account of photo-topography as applied in Canada, but the writer hopes he has not failed at least to give a general conception of the application of a most interesting and useful branch of scientific surveying to the Canadian Rocky Mountains, and one that entails mountaineering qualifications of a high degree. It is from the promotion of this science that has sprung the Alpine Club of Canada.

Chaba River Fortress Lake S. Sta. Chisel Pk. 10,004 ft.

Photo, A. O. Wheeler

FORTRESS LAKE AND CHABA RIVER
Main Divide of the Rockies between

Fig. 3

REPORT SUBMITTED

TO

THE ALPINE CONGRESS AT MONACO

BY

THE ALPINE CLUB OF CANADA

GEOLOGY OF THE CANADIAN ROCKIES

By E. M. Burwash

Introduction

*The Canadian portion of the North American Cordillera is divided into two distinct belts by a major topographical feature named by Dawson the Interior Plateau, a name which has been modified by Daly to "Belt of Interior Plateaus." It consists of a number of flat-topped uplands of low elevation as compared with the ranges which lie along their northeast and southwest borders and divided from each other by erosional valleys of greater or less maturity. The flatness of their upper surfaces is attributable in some cases to planation of folded pre-Palaeozoic, Palaeozoic and Triassic rocks, in others to the flooding of these surfaces with lava either before planation was complete or subsequently. At its edges this belt of plateaus merges by a gradual upward trend into the mountain ranges on either side of it. The

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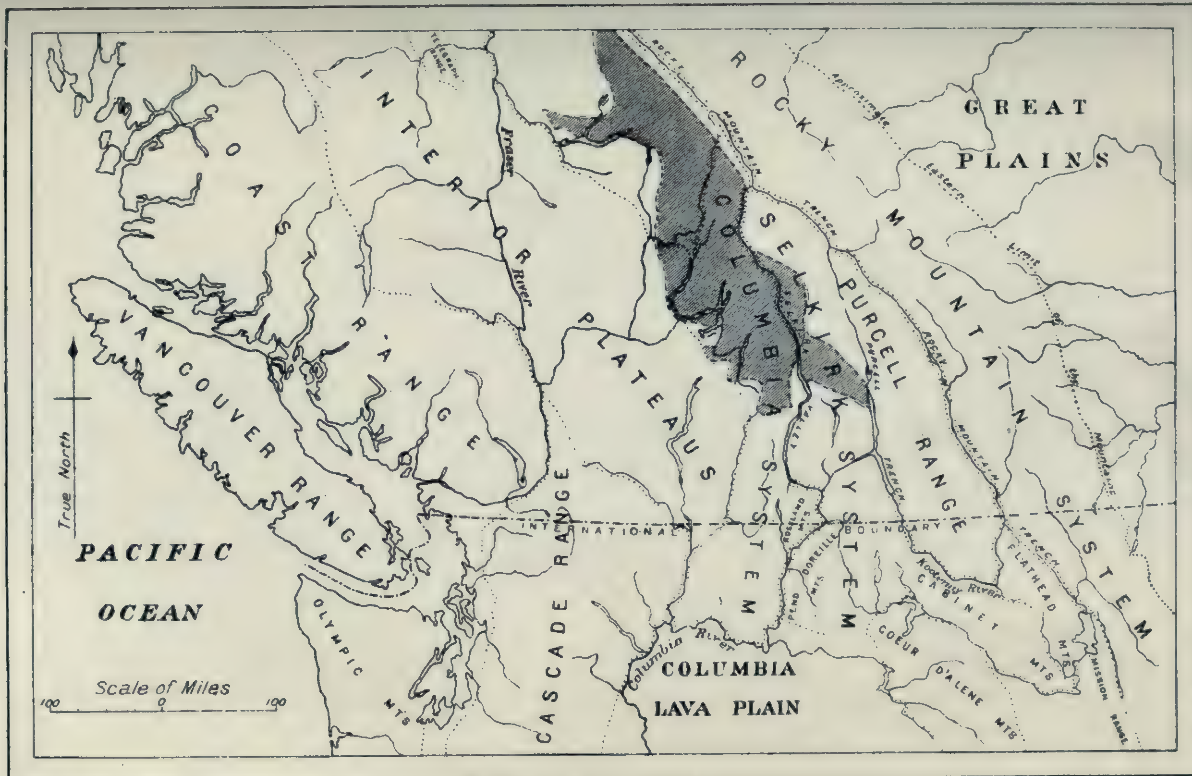
*Slide 1.—Mountain systems of the Canadian Cordilleran area (southern part) with their intervening features, the Interior Plateaus and the Rocky Mountain, Purcell and Selkirk "trench" valleys The shaded area represents the Archaean protaxis which separates the eastern and western depositional belts.

zone of mountains on the west includes the Coast and Vancouver Island ranges, that on the east the Columbia, Selkirk, Purcell and Rocky Mountains. Since the work of the Alpine Club of Canada has been mainly confined to the eastern ranges, this paper proposes to deal only with that part of the Cordillera.

†The ranges included in the eastern zone are separated from each other by a series of remarkable valleys whose history has not yet been fully dealt with, but which are held by Daly‡ to be of erosional rather than structural origin. Of these the most notable is the Rocky Mountain Trench which extends for 800 miles in a N. 30 deg. W. direction from a point a short distance south of the International Boundary to the Liard River. Owing to gentle crustal undulations transverse to its length, it is occupied by several rivers which flow in different directions alternately. It separates the Laramide or Rocky Mountains proper from all those which lie further west. Diverging from the Rocky Mountain Trench at a point about two hundred miles north of the International Boundary, a similar valley known as the Purcell Trench, extends in a S. 12 deg. E. direction for a similar distance, and includes between itself and the parent trench a triangular area which is occupied by the Purcell Range. In a similar manner the Selkirk Valley, in which flows the Columbia River, diverges from the main valley about sixty miles north of the Purcell Trench and running roughly parallel to the Purcell Trench encloses between that valley, the Rocky Mountain Trench and itself, the Selkirk Range. To the west of the Selkirk Valley lie the Columbia Mountains, which are bounded on the west side by the Interior Plateaus.

†Slide 2.—View of the Rocky Mountain Trench from the heights E. of Golden (C.P.R.) Dogtooth Mountains opposite and Columbia River flowing in the trench.

‡For a full discussion of the nomenclature of these mountains consult R. A. Daly, Memoir 38, Geological Survey of Canada, pp. 17 *et seq.*



Geological Survey, Canada 1458

DIAGRAM SHOWING MAJOR SUBDIVISIONS OF CORDILLERA AND APPROXIMATE DISTRIBUTION OF SHUSWAP TERRANE, SOUTHERN BRITISH COLUMBIA

To accompany Memoir by R. A. Daly

SLIDE No. 1

For Explanation See Page 118

Depositional History

Geologically the province of British Columbia and the western border of Alberta belong to two great belts of deposition the trend of which is parallel to the western coast of the continent and to the whole Cordilleran system. These are divided from each other by a line of Archaean areas (marked in pink on the map-slide), which were originally correlated with the Laurentian formation by Dawson*, who also adopted the local formation name, "Shuswap Series." This position has been accepted provisionally at least by Daly, who has described the terrane as consisting of very ancient sediments including crystalline limestones, quartzites, phyllites and sericite-quartz schists derived from an ancient granite terrane not now visible in exposure. These sediments were penetrated later by potassic granites which are "of typical Laurentian habit. The tremendous development of aplites and pegmatites, the constant occurrence of the sill and *lit par lit* forms of injection, and the monotony of composition are all characteristics of the classic Laurentian of Eastern Canada and of the older granites in Fennoscandia, etc."† The area of these rocks formerly exposed was probably much larger than at present, and according to Dawson may have been almost continental in size, but they have been largely or wholly covered by later sediments and the exposure of the parts now visible was probably due to subsequent uplift and consequent denudation. The Shuswap rocks are best seen on the main line of the Canadian Pacific Railway in the western Selkirks and Gold Range between Albert Canyon and Sicamous Lake. The Priest River formation is regarded as their equivalent further south at the International Boundary.

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*Dawson, G.M., Geol. Surv. Can. Vol. IV (1888-9), p. 29B.

†Daly, R.A., Geol. Surv. Can. Memoir 68, p. 40:

Beltian

On the eastern flank of this Archaean axis was deposited a great thickness of sediments derived from it, and possibly from land further west. This deposition was unconformable on the Shuswap terrane and took place in pre-Cambrian time. It is correlated by Daly with the Beltian deposits, named by Walcott after the Belt Mountains of Montana, which have been determined as pre-Cambrian by Walcott and Keller. Their greatest development in Canada is to be seen in the Selkirk Mountains on the line of Canadian Pacific Railway, but they are also found in the Mount Robson region to the north and along the 49th parallel (the International Boundary) to the south. Their maximum thickness as estimated by Daly is about 32,750 feet and they pass unconformably upwards into the Lower Cambrian in the Selkirk section. The names Nisconlith, for the lower part, and Selkirk Series, for the upper part, were at first given to them by Dawson, the former applying to rocks on both sides of the Archaean axis, but later study seems to prove that the so-called Nisconlith on the west side is in reality a part of the Archaean complex, and Daly therefore combines the eastern Nisconlith with part of the Selkirk Series under the name "Selkirk Series," to include the whole of the Beltian rocks exposed on the main line of the Canadian Pacific Railway. He divides it into a lower argillaceous and an upper quartzitic division and these into subordinate formations. On the International Boundary he has assigned other names to the subdivisions of the Beltian, which there represent the upper or "Glacier" division of the Rogers Pass section, as shown in the accompanying correlation-table (p. 109).

In the Bow River section of the Laramide Range, the Corral Creek Quartzite and the Hector Metargillite also represent the two upper members of the Glacier Division.

The following tabulation represents the section exposed in the Selkirk mountains along the Canadian Pacific.

System		Formations (Daly)	(Dawson)
Lower Cambrian		Sir Donald quartzite, 5,000 feet Ross quartzite (upper part) 2,750 feet ±	Selkirk Series
Beltian	Glacier division	Ross quartzite (lower part), 2,500 ft.± Nakimu limestone, 350 feet Cougar formation, quartzite with metargillitic beds, 10,800 feet	Selkirk Series
Beltian	Albert Canyon division	Laurie formation, metargillitic limestone and quartzite, 15,000 ft. Illicillewaet quartzite, 1,500 ft. Moose metargillite, 2,150 ft. Limestone (marble), 170 ft. Basal quartzite, 280 ft.	Nisconlith Series

Unconformity
Archaean—Shuswap Series.

At the Rocky Mountain Trench which marks the eastern edge of the Selkirk Range, there is a great fault whose downthrow is toward the east so that newer (Silurian) strata are exposed on the western slope of the Rocky Mountains, and it is not until the boundary of Alberta is reached at the summit of the range that the Beltian rocks are again exposed by a second series of faults. At this locality they are separated from the Lower Cambrian (Olenellus zone) above them by a thick basal conglomerate marking an unconformity due to an incursion of the sea over an erosion surface of slight relief, and composed of fresh-water sediments.* In other parts of the range, according to Allan,† the Beltian and Lower Cambrian are conformable, as Daly finds them in the Rocky Mountains on the 49th parallel and in the Selkirks both on the 49th parallel and in the railway section. In the Yellowhead Pass near Mount Robson,

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*Walcott, C. D., Smithsonian Miscellaneous Collections, Vol. 53, No. 7.

†Allan, J. A., Geol. Surv. of Canada, Memoir 55, p. 60.

however, the Lower Cambrian lies unconformably on the Miette sandstones which there represent the Beltian. The latter has there an exposed thickness of 2,000 feet, but the base of the formation is not visible.‡

The Belt Terrane, as exposed in various parts of the Canadian Cordilleran area, may therefore be summarized as follows.

Locality	Formations	Lithology	Thickness
I. Selkirk Range 49th parallel	Wolf (lower part)	Grits conglomerates sandstones	1,900 feet
	Monk	Quartzite conglomerate metargillite	5,500 feet
	Irene	Volcanics	6,000 feet
	Irene	Conglomerate	5,000 feet
II. Selkirk Range Canadian Pacific section	Glacier division	Quartzite limestone metargillite	13,650 feet
	Albert Canyon division	Metargillite limestone quartzite	19,100 feet
III. Purcell Range (49th parallel)	Creston	Quartzite	9,500 feet (base concealed)
IV. Galton Range (49th parallel)	Altyn	Siliceous dolomite	650 feet (base concealed)
V. Clarke and Lewis Ranges (49th parallel)	Altyn	Siliceous dolomite	3,500 feet (conformity)
	Waterton	Dolomite	200 feet (base concealed)
VI. Bow River Valley C.P.R., E. Rockies	Hector	Shales and conglomerates	1,302 feet (conformity)
	Corral Creek	Sandstone	1,320 feet
VII. Robson Peak Rocky Mts. Yellowhead Pass	Miette	Sandstone	2,000 feet (base concealed)

‡Walcott, C. D., Smithsonian Miscellaneous Collections, Vol. 57, No. 12.

On the boundary, therefore, the Beltian terrane passes from a predominantly siliceous to a dolomitic facies as we cross the mountains eastward, but this tendency cannot be traced in the Bow River and Yellowhead Pass sections further north.

The Cambrian System

Lower, Middle and Upper Cambrian rocks are found overlying the Beltian throughout the mountain area under consideration, and are in part richly fossiliferous. Their lithological characters, thickness and locality of occurrence may be briefly indicated for the three well-known sections as follows:

(1) In the Yellowhead Pass* the Cambrian sediments lie unconformably on the Beltian in the vicinity of Robson Peak and include the following formations:

Age	Formation Name	Lithology	Thickness
Upper Cambrian	Lynx	Limestone	2,100 feet
Middle Cambrian	Titkana	Limestone and dolomite	2,200 feet
	Mumm	Arenaceous limestones	600 feet
	Sitks	Limestone and shale	1,700 feet
	Tatay	Arenaceous limestone	800 feet
	Chetang	Limestones	900 feet
Lower Cambrian	Hota	Limestone with quartzite	800 feet
	Mahto	Quartzite with shale	1,800 feet
	Tah	Shale with some limestone	800 feet
	McNaughton	Quartzitic sandstones	500 feet
		Total thickness	12,200 feet

(2) On the Canadian Pacific Railway line, in the summit region of the Selkirks, the Beltian passes conformably upward into the Lower Cambrian, which here includes two formations, the upper part of the Ross Quartzite and the Sir Donald Quartzite, a total thickness of 7,750 feet. These rocks are found at the axis of the

*See McEvoy, Geol. Surv. Can. New Ser. Vol. XI, Part D., and Walcott, C. D., Smithsonian Misc. Coll., Vol. 57, No. 12.

range and form the highest summits. Ross Peak and many summits in the Purcell Range adjoining are composed of the Ross Quartzite, while Mounts Sir Donald, Avalanche, Macdonald, Tupper and Hermit are composed of Sir Donald Quartzite.

In the C.P.R. section of the Laramides, Lower, Middle and Upper Cambrian measures are exposed on both flanks of the range. They lie uncomformably in some places but conformably in others, on the Beltian rocks, and pass conformably into the later Palaeozoic horizons above. The Lower Cambrian section exposed in this part of the Rocky Mountains may be correlated with that in the Selkirks, thus*:

Age	Selkirk Mountains	Rocky Mountains
Lower Cambrian	Sir Donald quartzite, 5,000 ft.	Mount Whyte, 390 ft. St. Piran, 2,705 feet ferruginous sandstone Lake Louise, 105 feet shale
	Ross quartzite, 2,750 feet	Fairview Formation, 600 feet

The Middle Cambrian of the Canadian Pacific section has a thickness of 4,963 feet, and consists of dolomitic and other limestones and shales which are exposed notably in Mount Stephen and Cathedral Mountain near Field. The Upper Cambrian in the same locality is 9,815 feet thick or more, and comprises dolomitic and blue limestones, phyllites and shales.

In the boundary section the Lower and Middle Cambrian are the youngest formations known in the Selkirk, Purcell, Galton, Lewis and Clarke Ranges with the exception of the Kishenehn, a Miocene formation. In the Macdonald Range a limestone terrane occurs which is attributed to the Mississippian and Devonian.

*Daly, R. A., Geol. Surv. Can. Memoir 68, p. 84.

Photo, Daly's Memoir No. 68 SLIDE No. 2
For Explanation see Page 118

Photo, Daly's Memoir No. 68 SLIDE No 6
For Explanation see Page 118

The Lower Cambrian deposits are 4,650 feet thick in the Selkirks at this latitude, decreasing to 4,200 in the Lewis and Clarke Ranges. They are predominantly quartzitic in the western part of the section (Selkirk Mountains) becoming more argillaceous, with some limestone, and also ferruginous toward the east. In the last point they correspond with the rocks exposed on the main line of the Canadian Pacific Railway. The U. Cambrian varies from 11,265 feet of metargillite and quartzite in the Purcells to 5,820 feet in the Lewis series with some limestone.

Ordovician

In the Robson Peak region the Ordovician strata are the uppermost rocks exposed, and are conspicuous in the summit of the great peak itself, which consists of about 3,000 feet of "massive and thin-bedded limestones, partly siliceous, arenaceous and dolomitic,"* which lie conformably on the Upper Cambrian rocks beneath. On the Canadian Pacific section the Ordovician includes the Goodsir shales (6,040 feet) and the Graptolite shales (1,700 feet), which are exposed at intervals in the western part of the pass. No Ordovician rocks are exposed in the boundary section from the Selkirks eastward, and none are reported by McEvoy in the Crow's Nest Pass.

Silurian

Rocks of this age do not occur in the Selkirks nor in the Robson Peak region, but are found on the western slope of the Laramide Range, both north and south of the Kicking Horse Pass (C.P.R.), where they are known as *Halysites* Beds and a lower quartzite and have a maximum thickness of 1,850 feet, composed of dolomites and quartzites.

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*Walcott, C. D., Smithsonian Misc. Coll. Vol. 57, No. 12.

Devonian

McEvoy reports* rocks of this horizon on the eastern edge of the Laramide Range as one approaches the Yellowhead Pass, and others are found in the Bow Valley along the Canadian Pacific where they are mainly dolomites with some sandstone and quartzite, 1,500 feet thick, and known as the "Intermediate Limestone." Devonian rocks are not mentioned by Daly as occurring on the International Boundary, but doubtless extend for some distance to the south of the Bow Pass.

Carboniferous and Devonocarboniferous

Some of the rocks described by McEvoy on the Athabaska River may belong to one of these horizons, which are both well represented in the Bow River Pass by the Banff Limestones, which consist of 3,800 feet of limestone with 600 feet of interbedded shales. The lower part of these measures is of Lower Carboniferous age (Mississippian), passing downward into the Devonian. Carboniferous limestones are also prominent among the mountain-building rocks at the Crow's Nest Pass, but do not extend as far south as the boundary.

Mesozoic Rocks

Lying upon the Lower Carboniferous rocks with no apparent break in deposition in the C.P.R. section are the Upper Banff Shales, 700 feet thick, which are red rocks of Triassic age.† They are followed by a great thickness of Cretaceous rocks, mainly shale with some quartzite, sandstone and conglomerate aggregating at least 5,000 feet of strata. They are described by

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*McEvoy, Geol. Surv. Can. Vol. XI. New Series, 1898, pp. 29D et seq.

†See Dowling, D. B., Geol. Surv. Can. Publication No. 1035, pp. 20 and 23.

McConnell‡ as extending from the Kootanie to the Benton formation. The foothills immediately east of the range are also composed of Cretaceous and Laramie beds.* Further south a trough of Mesozoic rocks, about ninety miles in length, lies within the mountains to the west of the most eastern (Livingstone) range and parallel to it. This trough has a maximum width of about ten miles and contains the coal-seams of the Crow's Nest Pass. It differs from the Cretaceous beds of the Bow River section, which also contain coal in having interbedded pyroclastic materials and in the fact that its lowest portion consists of Jurassic beds, the Fernie Shales. The section exposed in the Crow's Nest Pass is given by Dowling† as:

Age	Formation Names	Rocks and Thickness
Cretaceous	Dakota	Conglomerates and sandstones
	Kootenay	Sandstones and shales with coal maximum 5,300 feet
Jurassic	Fernie	Shales, 1,060 feet Sandstone, 500 feet

Summary of Deposition

We have thus evidence of deposition, which in some parts of the geosyncline was continuous from the base of the Beltian to the middle of the Carboniferous. This continuity was broken in the eastern Rockies by an important unconformity at the base of the Cambrian, which indicates a period of emergence along the eastern line of the trough prior to the Olenellus time, and in other regions to the north and south the Silurian is missing which may also imply erosional conditions there during that period. The Permian and Upper Carboniferous are

‡McConnell, R. C., Geol. Surv. Can. Ann. Rep. 1886, p. 16D.

*Dawson, B. V., Geol. Surv. Can. Ann. Report, 1882-4, p. 107D et seq.

†Dowling, D.B., Op. cit.

also absent and the Trias appears to lie conformably on the Mississippian strata.

Igneous Rocks

The Banff Shales to the south of the Kootenay Pass "are associated with a volcanic trap outflow." In the boundary section volcanic rocks are of greater importance than elsewhere. A massive basic flow called by Daly the "Purcell Lava," extends across the Lewis, Clarke, Macdonald, Galton and Macgillivray ranges, *i.e.*, across the Rocky Mountain and eastern Purcell systems. It was supplied from vents which are now visible locally as dikes, with accompanying sills. It includes vesicular, diabasic and other phases and as a whole may be classified as basalt. It forms a valuable horizon-marker about the centre of the Middle Cambrian. Intrusions of abnormal hornblende gabbro, also probably of Cambrian age, make their appearance as dikes in the eastern Rockies near the boundary, and increase in volume until their outcrops occupy large areas in the western Purcells, where they include the well-known Moyé sills.

In the western Rockies just south of the Canadian Pacific, Allan* has described an alkaline igneous complex, including nephelite syenite, ijolite, urtite and jacupirangite.

In the Priest River Terrane at the boundary some greenstone dikes occur, but the granite intrusions so common in the Archaean of the railway section further north are not to be seen there.

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*Allan, J. A., Geol. Surv. of Canada, Memoir 55, p. 181.

CORRELATIONS IN THE ROCKY MOUNTAIN GEOSYNCLINAL

	Castle Mountain, Bow River Series, C.P.R.	Selkirk Series Selkirk Range, C.P.R.	Summit Series, Selkirk Range, 49th parallel	Purcell Series, W. Purcells, 49th parallel	Lewis Series, Clarke and Lewis Ranges, 49th parallel
MIDDLE CAMBRIAN	Eldon limestone, 2,728 feet Stephen limestone, 640 feet Cathedral limestone, 1,595 feet		Beehive quartzite, 7,000 + feet	Kitchener quartzite (upper part), 5,000 ± feet	Kintla metargillite, 820 + feet Sheppard dolomite, 600 feet Siyeh limestone, 4,100 feet
LOWER CAMBRIAN	Mt. White metargillite, 390 feet St. Piran quartzite, etc., 2,705 feet Lake Louise metargillite, 105 feet Fairview quartzite, etc., 600 feet	Sir Donald quartzite, 5,000 feet Ross quartzite (upper part), 2,750 feet ±	Ripple quartzite, 1,650 feet Dewdney quartzite, 2,000 feet Wolf grit, 2,900 feet	Kitchener quartzite (lower part), 1,000 ± feet Creston quartzite, 5,000 feet	Grinnell metargillite, 1,600 feet Appekunny metargillite, 2,600 feet
BELTIAN	Hector metargillite, etc., 4,590 feet Corral Creek quartzite, 1,420 + feet **Base Concealed**	Ross quartzite (lower part), 2,500 ± feet Nakimu limestone, 350 feet Cougar quartzite, 9,700 feet Basaltic lava, 50 feet Cougar quartzite, 1,050 feet Lauric metargillite, 15,000 feet Illicillewaet quartzite, 1,500 feet Moose metargillite, 2,150 feet Limestone, 170 feet Basal quartzite, 280 feet **Unconformity**	Monk metargillite, etc., 5,500 feet Irene volcanics, 6,000 feet Irene conglomerate, 5,000 feet **Unconformity**	Aldridge quartzite, 6,000 + feet **Base concealed**	Altyn siliceous dolomite, 3,500 feet Waterton dolomite, 200 feet **Base concealed**

REPORT SUBMITTED
TO
THE ALPINE CONGRESS AT MONACO
BY
THE ALPINE CLUB OF CANADA

OROGENIC AND PHYSIOGRAPHIC HISTORY OF THE ROCKY MOUNTAIN GEOSYNCLINAL

By E. M. Burwash

1.—Orogenic History

The orogenic history of the eastern geosyncline has been outlined by Daly as follows:

"After the granitic invasion" (of the Shuswap sediments) "at least part of the Shuswap terrane was lifted above base level and was eroded before the lowest Beltian bed was deposited upon the surface of that terrane unconformably.

"[1]With that uplift the axial line of the Canadian Cordillera first became definitely outlined. The western Cordilleran belt became land and in general so remained until the close of the Mississippian (Lower Carboniferous) period; during the same long era the eastern belt was a geosynclinal area, its major axis having the same trend as the present Cordillera." An exception to this, according to Walcott, occurred near the end of the Beltian in

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[1]Slide 1—Mountain systems of the Canadian Cordilleran area (Southern Part) with their intervening features the Interior Plateaus and the Rocky Mountain, Purcell and Selkirk "trench" valleys. The shaded area represents the Archaean protaxis which separates the eastern and western depositional belts.

the eastern Rocky Mountains, when the Beltian deposits were sculptured in low relief by erosion before the resumption of deposition in the Lower Cambrian. "The Rocky Mountain geosyncline continued to sink and was filled with sediments in the Beltian (Selkirk Series), Cambrian, Ordovician, Silurian, Devonian and Mississippian periods. Within the (Canadian Pacific) railway zone volcanic action left its mark only in the Beltian Cougar formation" elsewhere the deepening of the vast downwarp was accomplished by vulcanism on a large scale, as represented for example in the Purcell, Grinnell and Irene basalts of the 49th parallel."[3]

". . . It is probable that much of the eastern belt became land at the close of the Mississippian and furnished clastic material to the long trough which was then beginning to deepen in the western Cordilleran belt.

"Permian sediments are possibly represented in the front range of the Canadian Rockies, but in both Cordilleran belts the Permian period seems to have been a time of erosion. . . ." The elevation to which this erosion was due was probably not accompanied by strong deformation as regards the eastern geosyncline, although the writer has found some evidence that the Coast Range of British Columbia became a folded mountain system at this time where marked schistosity was developed in the Devono-Carboniferous strata which overlie the later batholithic intrusions.[4] During the Triassic a "sea extended well into the Cordilleran area from the west. It is probable that these conditions characterized also the early part of the Jurassic period."

"It is still a question how far the Rocky Mountain sediments were affected" by the orogenic revolution of

[3]Daly, R. A., Geol. Surv. Can. Memoir 68, pp. 152 *et seq.*, but see also Allan, J. A., G.S.C., Memoir 55, for post-cretaceous vulcanism in the Western Laramides.

[4]Burwash, E. M., Geology of Vancouver and Vicinity, Univ. of Chicago Press, 1918.

the late Jurassic. "The structural relation of the Cretaceous beds in the front ranges to the Palaeozoic members shews that the Jurassic revolution did not essentially disturb those older rocks. West of the Rocky Mountain Divide there is no positive field evidence on the problem, so that no statement is yet possible as to how much the strong folding in the Purcell and Selkirk Mountains is to be credited to this revolution. The area now covered by those mountains was probably raised well above base level, for it bears no trace of Cretaceous sedimentation.

"Then followed the Laramide[4] revolution which crumpled . . . the long resistant Rocky Mountain geosynclinal. During the folding of the front range[5] rocks and their thrusting over the Great Plains, the interior ranges must have been strongly deformed. It is, therefore, possible that the Columbia, Selkirk and Purcell Mountains of the railway section attained their present structure during two different revolutions, the Jurassic and the Laramide. The relative importance of these revolutions in developing the visible folds and faults of the region remains an open problem."

[6]The structures produced by these orogenic movements in the Cordillera vary in the different ranges. The Selkirk Range, as a whole, has a synclinorial structure as exposed in the Canadian Pacific section. Its axial part consists of two parallel synclines, a major and a minor. These lie at the summit of the range and are parallel to it. The highest peaks have been sculptured from the minor syncline. On both sides of this axis the strata dip inward and the position of outstanding peaks on the

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[4]This occurred at the close of Cretaceous time.

[5]A term used to distinguish the eastern ranges of the Cordillera or Rocky Mountains proper.

[6]Slide 9.—Summit syncline of the Selkirks. The steepness of the dips and highly metamorphosed rocks suggest that longer erosion has taken place here than in the Rocky Mountains.

flanks of the range has been probably mainly determined by the more or less resistant nature of the rocks when subjected to erosion.[7 8 9]

In the Rocky Mountains at the same latitude, according to McConnell,[10] there are "two distinct geological provinces, the line of division being nearly coincident with the Sawback Range. The region east of the line has been broken by a number of parallel or nearly parallel longitudinal fractures into a series of oblong orographic blocks, and these tilted and shoved one over the other into the form of a westerly-dipping compound monocline. In the section examined (C.P.R.) there are seven principal faults, besides some of minor importance, and six well defined blocks, the latter resting on one another in regular succession from west to east. "The longitudinal dimensions of these blocks are said to exceed forty miles in some instances." The thrust producing these crust fractures and dislocations came from the west and must have been highly energetic in its action, as some of the breaks are of huge proportions, and are accompanied by displacements of many thousands of feet. The faulted region is now about twenty-five miles wide,[11] but a rough estimate places its original width at over fifty miles, the difference indicating the amount of compression it has suffered." Small overturned "drag-folds"[12] are seen along the courses of the overthrusts. The tilted blocks form parallel ridges which

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[7]Compare Canadian Alpine Journal, Vol. II, No. 1, 1909, "Structures in the Vicinity of Rogers Pass," by the present writer.

[8]Slide 10.—Mount Macdonald (Rogers Pass) from Mount Tupper. Illustrating peaks carved from the summit synclinal.

[9]Slide 11.—Mount Rogers (centre) and Mount Hermit (right) with structure lines extended to suggest the amount of strata removed by erosion.

[10]McConnell, R. G., Geol. Surv. Can. Ann. Rep. 1886, p. 32D.

[11]Slide 12.—Overthrust fault-block of harder Cambrian rocks which has produced "drag-folds" in the softer Cretaceous strata beneath.

[12]See Coleman, A. P., Canadian Alpine Journal, 1908, p. 224.

have ordinarily been carved by erosion into serrate ranges, and the intervening valleys have been so modified by erosion as to be now erosional in type.[13] The softer Cretaceous strata have been largely removed from the western slopes of the "writing-desk" mountains and are seen only on the western sides of the valleys beneath the over-riding Cambrian strata.

In the western part of the chain no reversed faults have been recognized, and open and overturned folds play the most important role.[14] The summits in this belt are often of the "denuded syncline" type. In some cases the faults of the eastern belt run out toward the south into overturned folds as seen in the Kananaskis Pass, or acute anticlinals, as Sentinel Mountain by the Kootenay Plains. On the boundary the most eastern (front) ranges are rather broadly folded, but faulting plays[15] a more prominent part further west, without developing into a regular monoclinal structure, as dips of the tilted blocks in both east and west directions occur. Along the whole eastern front of the mountains a great overthrust has carried the Cambrian and succeeding formations several[16] miles over the Cretaceous deposits of the Great Plains, and to this is due the strikingly abrupt and uniform appearance of the front range as approached from the east.

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[13]Slide 13.—A typical fault-block: as seen from the east the strata appear nearly horizontal but dip toward the west away from the observer. The face seen is that corresponding to the original fault-scarp. The tilted block has been dissected along transverse joints into a line of separate peaks.

[14]Slide 14.—Where the thrust has produced only an overturned fold, which may be fractured further north, resulting in an overthrust fault.

[15]Slide 15.—Sharp anticlinal and synclinal folds replacing the fault-block monoclinal in a part of the range further south than the C.P.R. section.

[16]Slide 16.—Section near the 49th parallel, showing the folded pre-Cambrian and Cambrian strata of the Front Range overthrust several miles eastward over the Cretaceous strata of the Great Plains.

2.—Physiography

"As a result of the Laramide Revolution," to quote Daly's summary further, "the Canadian Cordillera first reached its full length and breadth. Its constituent ranges were doubtless much higher than those now existing. . . All Tertiary and Quaternary time has witnessed steady erosion. . . Thus the Tertiary and later history of the Cordillera must be written in terms of its physiographic development since the beginning of the Eocene."

Dawson's interpretation of this history was, in brief: (1) Long erosion resulting in planation in the Interior Plateau (with possibly a mature topographic development in the Selkirks and the Coast Range?) followed by: (2) a late Pliocene uplift of 2,000 feet and subsequent canyon-cutting. This hypothesis he applied not only to the Interior Plateaus but also to the Coast Range. Daly concludes that "this hypothesis needs continued scrutiny and matching with field observations. Two-cycle topography is suggested by the high rock-benches in the Rocky Mountain Trench and . . in the Interior Plateaus, but there is still no definite proof that the second cycle was begun in each case by uplift in the late Pliocene." Facts which are noteworthy in the Selkirk Mountains especially and which bear on this problem are: (1) The very marked accordance of the summits in height, as seen from a position near their level; (2) the common occurrence of rock-cut benches and wide hanging valleys at a level considerably below the summit level. These are[17] [18] generally above the tree line and often

[17]Slide 18.—Bench-like but sloping surface supporting the Illecillewaet névé, Selkirk Mountains, with accordant summits rising above it.

[18]Slide 17.—Mount Begbie, altitude 8,946 feet, viewed from the north. This is one of the mountains of the Columbia (Gold) Range near the Interior Plateaus, and is formed by erosion from the Archaean complex. Note the bench above tree-line below the summit, and the deeper valley in the foreground and on the right.

occupied by the snow-fields and glaciers of the present day. Apart from the hypothesis that they represent a cycle of erosion before a general uplift to the present level, there is a strong probability, emphasized by Daly, that they are in many cases at least due to differential erosion, including glacial action, above tree-line, and are therefore of very recent formation. Willis and Smith,[19] however, ascribe similar features in the Cascade Mountains of Washington to a cycle of erosion older than the present one. The bench which supports the Illecillewaet névé, the Rogers Amphitheatre and other benches at about the same level near Rogers Pass may be mentioned as examples of this class of features. (3) Deeply incised below these are the major canyons of the range which are tributary and graded down to the great trench - valleys[20] which have been described as separating the different mountain-systems of the region. These and the trenches themselves show clear evidence of occupation by ice during the Pleistocene period in their rounded cross-sections and polished rocks. They are therefore pre-glacial in age. The upper valleys may therefore be either older or younger than the lower, according to whether we accept the two-cycle or the differential and glacial erosion hypothesis as to their formation. (4) In the bottoms of the deeper canyons some recent cutting has taken place.

"It is highly probable that the glaciation of the Pleistocene period was intermittent."[21] Although no interglacial deposits have been recognized within the Cordilleran area, similar successions of deposits, including interglacial clays, are to be seen both on the Coast and on the edge of the Great Plains near Calgary, and are both attributable to the action of the Cordilleran ice-

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[19]See U.S. Geological Survey, Professional Paper 19.

[20]Slide 3.—Purcell Trench, dividing Purcell Mountains from the Selkirks. Note glacial rounding of the trench, also its straightness.

[21]Daly, R. A., Geol. Survey of Canada, Memoir 68, p. 158.

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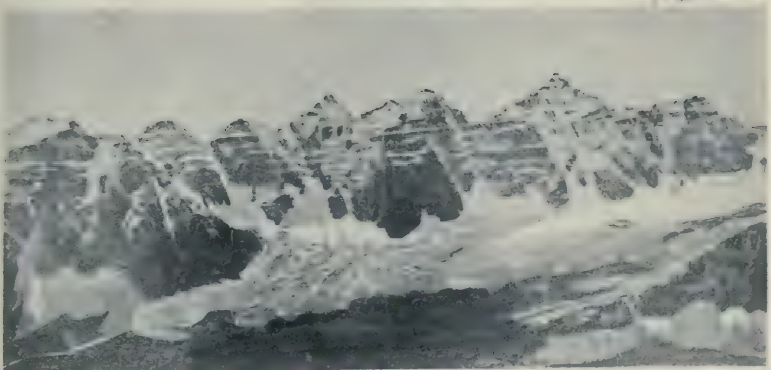
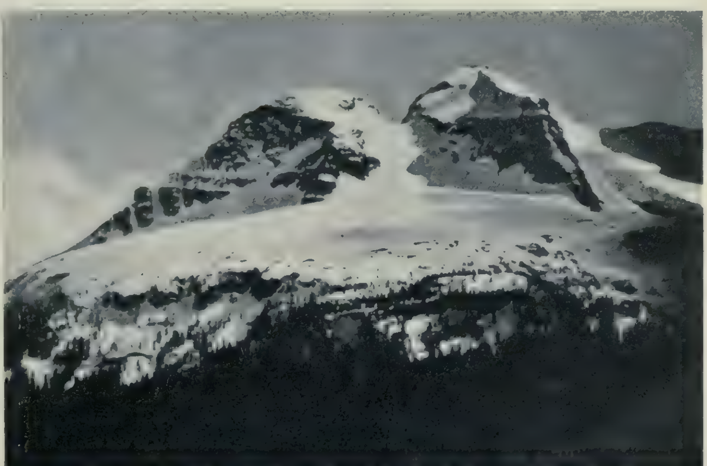


Photo, A. O. Wheeler

SLIDE No. 13

For Explanation See Page 119



Photo, Daly Memoir No. 68

SLIDE No. 17

For Explanation See Page 120

cap. The results of glacial action are evident throughout the Cordillera in the polishing and rounding of rock-surfaces including the lower summits, rounded major and hanging valleys, cirques, lakes, moraines and glacio-fluvial deposits which recent streams in many cases have been actively removing and re-sorting and redepositing.[22] The higher peaks, formerly nunataks, and the higher saddles have been reduced in many cases by cirque cutting to horns and sharp divides. In recent times, also, a fresh attack by the streams on the bottoms of the rock-cut valleys has produced steep-sided young canyons like the Albert Canyon of the Illecillewaet River. "That process has been accompanied by the degradation of the drift-barriers of glacial lakes"[23] lowering their waters and leaving some of the numerous post-glacial deltas standing above the present levels of the lakes in which they were formed.

Glacial erosion is still active in the higher valleys and cirques where hundreds of névés and glaciers still exist. A marked phenomenon during the last twenty-five years has been the steady recession of the ice-tongues in most cases, while an oscillatory movement has been characteristic of some.[24]

A vast amount of work still remains to be done in the more inaccessible parts of the Cordillera before a detailed knowledge of it will be acquired. On the other hand it may be expected that the study of the transverse sections already made along the more easily travelled routes will prove to have furnished a tolerably correct estimate of the more important general conditions which prevail, and a historical outline whose broader features will require little modification.

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[22]Slide 19.—Glacial cirque topography, west side of the Purcell Trench. Bench-like effect due to confluence of cirques.

[23]Daly, R. A., Geol. Survey of Canada, Memoir 68, p. 158.

[24]See Wheeler, A. O., "The Selkirk Range," and papers by the Messrs. Vaux in the Canadian Alpine Journal.

EXPLANATION OF LANTERN SLIDES

Accompanying the papers on
(1) Geology and (2) Physiography,
contributed by The Alpine Club of Canada

Slide 1.—Mountain systems of the Canadian Cordilleran area (southern part) with their intervening features, the Interior Plateaus and the Rocky Mountain, Purcell and Selkirk "trench" valleys. The shaded area represents the Archaean protaxis which separates the eastern and western depositional belts.

Slide 2.—View of the Rocky Mountain Trench from the heights E. of Golden (C.P.R.), Dogtooth Mountains opposite and Columbia River flowing in the trench.

Slide 3.—Purcell Trench, dividing Purcell Mountains from the Selkirks. Note glacial rounding of the trench, also its straightness.

Slide 4.—Geological Map of the Canadian Cordillera.

Slide 5.—Beltian and Cambrian Rocks of the Rocky Mountain belt as correlated by Daly for the railway and 49th parallel sections.

Slide 6.—Summit of Mount Tupper, Rogers Pass, Selkirk Range, showing the character of the Sir Donald Quartzite.

Slide 7.—Ripple marks in Lower Cambrian Quartzite at at the summit of the Selkirks at the 49th parallel.

Slide 8.—View of Mount Thompson across Kintla Lake (Clark Range, 49th parallel). The Mountain is 5,500 feet high above the lake and consists of the massive Siyeh (Middle Cambrian) Dolomite formation.

Slide 9.—Summit syncline of the Selkirks. The steepness of the dips and highly metamorphosed rocks suggest that longer erosion has taken place here than in the Rocky Mountains.

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REPORT SUBMITTED

TO

THE ALPINE CONGRESS AT MONACO

BY

THE ALPINE CLUB OF CANADA

NOTES ON THE GLACIERS OF THE MAIN AND SELKIRK RANGES OF THE CANADIAN ROCKY MOUNTAINS

By A. O. Wheeler

Introduction

The writer submits the following notes with an apology. He is not an expert in glaciology and can only deal with the subject from the view-point of a topographer, through observations derived from his photo-topographical surveys in the Main and Selkirk Ranges during the past twenty years, and from the notes of others who have a more technical knowledge of the subject.

Probably the most comprehensive and detailed study of glaciers of the Main and Selkirk Ranges has been made by William H. Sherzer, Ph.D., in a treatise published by the Smithsonian Institution of Washington, U.S.A., in 1907, entitled "Glaciers of the Canadian Rockies and Selkirks."

Dr. Sherzer spent the summer of 1904 in the studies of four of the best known glaciers of the Main Range and of two of the Selkirk glaciers. In the Main Range he deals with the Victoria, Lefroy, Wenkchemna and Yoho Glaciers, and in the Selkirks with the Illecillewaet and Asulkan glaciers.

In this careful and scientific work Dr. Sherzer gives the result and deductions of his studies and observations and, incidentally, much information upon the composition, action and movement of glaciers and their functions and attributes.

In a most instructive article written by him for the Canadian Alpine Journal, 1908 issue, he deals with the glaciers of the Canadian Rockies in more general terms which may be epitomized as follows:—

Dr. Sherzer's Deductions

In the Canadian Rockies and Selkirks are found ideal conditions for glacier formation: broad valleys, basins and gentle slopes; high altitude and latitude; moisture-laden winds from the Pacific Ocean, causing a heavy snowfall upon the western slopes and about the crests of these great systems.

Principal Types

Without attempting to draw any sharp lines of distinction between them there may be recognised four types of glaciers, all but one of which have numerous representatives in the Canadian Rockies and Selkirks. The one not now represented occupied the region during the previous geological epoch and its work is much in evidence in and about the mountains. These types may best be described in the order of their simplicity, frequency and development.

Alpine Glaciers

In its simplest form the type originates from the snow which accumulates about a mountain pass, or within an amphitheatre, combined with that precipitated directly into the valley, or avalanched from adjacent slopes. In appearance, a great frozen river, it slowly winds its way down a valley to a level determined by factors of which the chief are: the latitude, thickness of the ice, exposure

to the sun, amount and distribution of rocky débris and the amount of snow and ice urging the glacier forward. Canadian examples are the Victoria, Yoho and the easternmost stream of the Asulkan glaciers. Glaciers of the alpine type may receive tributaries from confluent valleys and these in turn receive tributary ice-streams.

Not infrequently it happens that the main glacial stream does not fill the valley and it is separated from its tributary streams by a precipice, or very steep slope, over which the ice and snow are avalanched. The higher glacier is termed a *hanging* or *cliff* glacier, as seen on the eastern shoulders of Mts. Victoria and Lefroy, and the glacier formed by the recementing of the ice fragments is spoken of as a *reconstructed* or *regenerated* glacier.

A very interesting example of such a regenerated glacier is formed from the hanging Lefroy Glacier, the fragments of which accumulate at the foot of the eastern wall of Mt. Lefroy, upon the upper western margin of the Mitre Glacier. There is piled up, mainly in the summer, a mass of ice fragments, along with the ground-morainic material manufactured beneath the hanging glacier, which gives rise to a regenerated glacier resting upon the Mitre Glacier and which is more or less independent of it. The course of the regenerated Lefroy Glacier is across Mitre Glacier, where it dumps upon the opposite side a great heap of ground moraine, while it is at the same time carried bodily towards the Victoria Glacier. Such a glacier, of which this is the best example known, has been more or less appropriately called *parasitic*.

Piedmont Glaciers

When a well-nourished glacier of the alpine type flows from a valley out upon the adjacent plain it has a tendency to spread laterally as soon as the restraint of the rocky walls is removed. In the case of such glaciers

derived from a series of neighbouring valleys their expanded extremities may coalesce laterally and form a glacier of the *piedmont* type. The separate alpine glaciers retain their independence so far as nourishment, structure, rate of movement and geological work are concerned and may better be termed *commensal* streams than tributaries. In their form, size and direction of movement they are more or less affected by their neighbours, gaining in protection and power by the union, so that a piedmont glacier is able to maintain itself at a lower level than could its separate commensals.

Such glaciers are peculiarly broad and short and present a relatively great amount of frontage, which is more or less irregular or lobed by the noses of the component streams, some of which may be advancing while others are stationary or in retreat. The Wenkchemna* is an interesting example of this type, having a length of one-half to one mile, a breadth of about three miles and a frontage of over three miles. About a dozen commensal streams may be recognised which originate in the minor depressions upon the protected northern slopes of the Ten Peaks. The Horseshoe Glacier at the head of the neighbouring Paradise Valley is of this same type, containing some sixteen alpine component streams.

A similar although less characteristic type of piedmont glacier may originate upon an elevated mountain slope, which is crossed by a series of sub-parallel depressions, separated by rather low divides. Each depression may at first support a small alpine glacier which, under favourable conditions for growth, may increase in thickness until it more than fills its bed and unites laterally with its neighbours. If the supply of snow is sufficiently reduced, the loss by wind action, melting and evaporation may uncover again the divides and the piedmont glacier shrinks into its original alpine components, thus attaining

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***See illustration facing page 116—Slide No. 13.**

Mitre Glacier Mt. Lefroy (11,220 ft.) Victoria Glacier and Abbot Pass Mt. Victoria (11,355 ft

GENERAL VIEW OF VICTORIA GLACIER AND ITS TRIBUTARIES

its second childhood. Such a glacier would have the position of a hanging or cliff glacier and might nourish another of alpine type or give rise to a regenerated glacier.

Upon the high western slope of the Asulkan Valley there existed such a glacier in recent geological time, which avalanched its ice to the alpine glacier which occupied the valley itself. The Asulkan Glacier, with its three commensal streams, is all that is left to show the piedmont character of the original, the remainder of the glacier having been resolved into its alpine components, lying between the Dome and Mt. Abbott.

Local Ice-Caps

There are extensive fields of stratified ice and snow which are represented in the Canadian Rockies by the Waputik and Columbia Ice-fields and in the Selkirks by the smaller Illecillewaet field. They must originate in a system of alpine and piedmont glaciers which have been unable to drain away the ice as fast as it was supplied, and, if the expression may be permitted, the entire region is flooded with snow and ice. Accumulation continues until the lobes of ice which come into existence about the margin of the cap are able to drain away the excess, when an approximate condition of equilibrium is established. These marginal lobes may reach neighboring valleys, or the adjacent plains, and give rise to alpine and piedmont glaciers.

The surface of such ice-caps are generally sloping or undulating, strongly ripple-marked by wind action and free from rock débris. Owing to thickness of the ice and its sluggish conditions crevasses are not common. Occasionally rocky islands protrude through the frozen sea and are known as *Nunataks*. If the supply of snow is sufficiently reduced the surface of the cap is slowly lowered, the marginal lobes are withdrawn and there may remain only the original piedmont and alpine glaciers

from which the cap was developed. The field evidence is that all the existing group of glaciers in the Rockies and Selkirks were, in recent geological time, encased in such deposits of ice and snow, with only the higher peaks and ridges protruding.

Continental Ice-sheets

During the so-called Pleistocene stage of the earth's history conditions were favourable for the formation of glaciers over the entire region between the Rockies and the Pacific and from the International Boundary to Alaska. These conditions resulted from an increased precipitation over the region and a reduction in the mean annual temperature. In the way above noted local ice-caps developed wherever favourable conditions existed and later were completely buried in snow and their outlines obliterated. With the submergence of the higher ridges the filling of the intervening valleys would go on slowly and at one stage the entire western portion of the Dominion of Canada was heavily encased in ice.

The movement was mainly to the north, west and south, but piedmont glaciers of great magnitude developed along the eastern margin of the Rockies and reached out for many miles over the plains. In our imagination we may apply the same characteristics to this great ice-sheet, with its complex of submerged glaciers, that were noted for the local ice-cap. Climatic conditions finally changed and this continental type of glacier was slowly resolved into its components, only relatively few of which still remain to grace the landscape. Two similar ice-sheets developed farther eastward, either simultaneously or subsequently, one centering to the west of Hudson's Bay and the other in Labrador. Existing glaciers of this type are found in Greenland and the Antarctic region.

Hector Lake Mt. Balfour (10,731 ft.)

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A. O. Wheeler, Photo

MT. BALFOUR AND BALFOUR GLACIER FROM BOW PEAK

The view is of unusual geological interest, showing the relation of the névé-field to the short, Alpine glacier, the work of the drainage stream in covering the valley floor with gravel, and the formation of an extensive delta at the head of the lake. The left lateral and two medial moraines are well shown, as well as the transverse and marginal crevasses.

Glacial Erosion

When a glacier of considerable thickness moves over a jointed, stratified rock, especially if the dip of the strata is in the direction of the movement, masses of rock may be detached bodily, giving rise to what is termed *plucking*. By this action a glacier may leave its bed rougher than it found it, and furnish the sites for lakelets, such as the exquisite Lakes Agnes and Louise. An unusually fine example of this type of glacial erosion may be seen near the head of Paradise Valley, where blocks of quartzite as large as small houses have been disrupted from the parent bed and shifted but a short distance. Standing upon the undisturbed portion of the beautifully glaciated bed and looking down the valley it is difficult to escape the conviction that many feet of strata have been similarly removed.

Many valleys in the Rockies and Selkirks appear to have been deepened and given their characteristic U-shape by alpine streams during the maximum period of glaciation. Their side walls up to a certain height have been smoothed and mountain spurs uniformly truncated, as is well shown upon the Lake Louise side of Mt. Fairview. Glaciers exert this erosive power to their very heads and excavate often a semi-circular amphitheatre or *cirque*, which may eat its way into the heart of a mountain and assist the atmospheric agencies in its destruction. A good example of such work is seen in the elevated Lake Agnes Valley, the glacier having nearly or quite disappeared from the region.

Transportation

Owing to its relation to the steep cliffs of the Ten Peaks, the Wenkchemna Glacier receives rock fragments along its entire breadth. In the case of the Victoria Glacier the upper valley is sufficiently narrow so that avalanches from Mt. Lefroy and Victoria may reach

entirely across the névé, thus distributing rocky débris throughout the glacier there in process of formation. When brought below the snow-line by the forward movement there is a concentration of this material over the entire surface of the two glaciers, forming a thin veneering by which further melting is much retarded.

Ordinarily the rock fragments accumulate in a relatively narrow zone along the margin of the glacier where they are moved very slowly forward, protecting from melting the ice upon which they rest until there is produced a sharp-crested ridge upon either side of the glacier—the *lateral moraines*. When such a moraine towers above the nose of the glacier more than a hundred feet, as is the case with the Illecillewaet Glacier, it is difficult for the ordinary observer to believe that it is essentially an ice-ridge with scarcely a foot of rock veneering. For the last few years the left lateral moraine of the Asulkan Glacier has been shedding its cover near the lower end and this ice-core is well exposed and is being slowly destroyed.

When a glacier has a tributary, as in the case of the Victoria Glacier, the adjacent lateral moraines of the trunk and tributary streams unite and form a *medial moraine* which has much the same appearance as the laterals. Under ideal conditions there will be one such medial for each tributary stream. Owing to the more rapid movement of the ice upon which they rest there is not the opportunity for the development found in the laterals. The material which rests upon the surface of the glacier has suffered but little abrasion and is thus readily distinguished from that which has occupied a basal position. Whenever a glacier is nourished, however, by a hanging glacier, as are the Lefroy, Victoria and Yoho Glaciers, there occurs a mixture of the two types of material in the lateral moraine.

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Mt. Walker (10,835 Ft.) Mt. Pilkington (10,830 Ft.) Mr. Freshfield (10,945 Ft.)

Photo, A. O. Wheeler

THE FRESHFIELD GROUP
Showing Medial Moraines of the Freshfield Glacier

Deposition

While the glacier is still in possession of a region there is being deposited in certain protected places beneath the ice, the clay, sand and glaciated boulders, firmly pressed together and typically unassorted. Bluish-grey in color, until it is oxidised, this constitutes the *ground moraine*. Owing to the action of sub-glacial streams patches of stratified sand and gravel may occur locally, the clay being carried away by the drainage. On account of the relatively slight grinding action of the present Canadian glaciers and lack of opportunity for lodgment, no extensive deposits of this ground moraine or *till* are now forming. In connection with the great continental ice-sheets, however, deposits were formed several hundreds of feet in thickness.

During the process of retreat all the material carried in or upon the ice must be deposited as fast as complete melting proceeds. The rock débris of the lateral and medial moraines will be set down in corresponding lines or ridges, but of surprisingly insignificant proportions when contrasted with the original moraines. Rock fragments distributed over the general surface of the glacier will be somewhat evenly distributed over the bed as it is uncovered, so long as the retreat is fairly uniform. In case the melting at the lower extremity, however, just equals the forward movement, the end of the glacier comes to a halt and its load is dumped in a ridge, forming a *terminal moraine*, providing we have a glacier of the alpine type, which alone can be considered to have an end. In the case of the three other types of glaciers such moraines, testifying to the stages of halt of the front, but not of the ice itself, are known as *frontal moraines*. A good example is seen in connection with the Wenkchemna Glacier, previously referred to.

A noteworthy type of ancient moraine is found in connection with the five most accessible glaciers along

the Canadian Pacific railway, viz: the Victoria, Horseshoe, Wenkchemna, Illecillewaet and Asulkan Glaciers. In each case its double character can be made out, either through its disposition in separate ridges, or difference in age where heaped together. The moraines consist of massive blocks of quartzite and sandstone heaped tumultuously together without the usual filling of gravel, sand and clay, differing strikingly from the moraines formed previously and subsequently. Between the great blocks, many of enormous size, spaces permit the entrance of man and other animals, so that Professor Tarr's name of "*bear-den moraines*" seems appropriate.

Space will not permit a detailed discussion of their probable origin. There is no reason for thinking that the ordinary filling material was originally present and removed by running water, or other agency. The blocks were not pushed along ahead of the ice, nor carried sub-glacially, but were carried either upon or within the ice. The ordinary process of weathering would produce as much fine as coarse material and give rise to a terminal moraine of the ordinary type.

An inspection of the cliffs from which the blocks were apparently derived shows that in all the five cases the general trend is northwest to southeast and that the bulk of the material was dropped to the eastward. The only plausible explanation which the writer (Dr. Sherzer) has been able to frame is that these glaciers became loaded with these coarse blocks as the result of a double earthquake disturbance, which probably crossed the Rockies and Selkirks in a northeast-southwest direction. The two shocks were separated by two or three centuries and the first was either the most severe or else it found more loose material awaiting its arrival. The mountains of the region appear to have served as a gigantic seismograph to record the time, number, relative intensity and direction of the shocks.

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W. H. Sherzer, Photo, 1904

OLDER OF THE TWO "BEAR-DEN" MORAINES, VICTORIA GLACIER, CANADIAN ROCKIES

The coarse character of the blocks and the lack of filling material are believed to have resulted from the loading of the ancient glacier by means of an earthquake shock.

A very rough estimate, based upon the rings of growth of trees, indicates that these disturbances happened from 700 to 1000 years ago, or from the 10th to the 13th centuries. Glaciers like the Geikie Glacier, whose bounding cliffs extend in a northeast-southwest direction, i.e., in the direction of the wave transmission, would be able to secure but a slight load and might reasonably be expected to show no such moraines. Similarly the Yoho Glacier, which is not bounded by steep cliffs capable of supplying such blocks, no matter how severe the disturbance. Upon the eastern shoulder of Mt. Burgess there lies a mass of coarse blocks very suggestive of these moraine blocks, which may have been shaken loose at the same time.

In describing their observations in the Sun Wapta Valley, Stutfield and Collie (Climbs and Explorations in the Canadian Rockies, 1903, page 126) note the occurrence of a similar type of moraine which may date back to the time of those above noted, or may have been due to a purely local rock-slide. In referring to the peaks, Woolley and Stutfield, they say: "These two last mountains appeared to have been conducting themselves in a most erratic manner in bygone ages. A tremendous rock-fall had evidently taken place from their ugly, bare, limestone cliffs and the whole valley, nearly half a mile wide, was covered to a depth of some hundreds of feet with this. The immense amount of rock that had fallen on the glacier below Peak Stutfield had prevented the ice from melting. Consequently the glacier, filling up the valley to a depth of at least two hundred feet, had moved bodily down and its snout, a couple of hundred feet high, covered with blocks of stone the size of small houses, was playing havoc with the pine woods before it on either side. In our united experiences, extending over the Alps, the Caucasus, the Himalayas and other mountain ranges, we had never seen indications of a landslide on so colossal a scale."

It is interesting to note that the Woolley - Stutfield range of cliffs has a northwest-southeast trend and that this débris was thrown to the *eastward*. It wil be of much interest to ascertain whether other glaciers, lying between the headwaters of the Athabasca and the railway, which are favourably situated with reference to their cliffs, show such moraines.

The foregoing remarks by Dr. Sherzer are based upon a few months study of some half a dozen of the glaciers of the Main and Selkirk Ranges, probably selected on account of their close proximity to the Canadian Pacific Railway and their easy accessibility from that Company's summer hotels. Notwithstanding, they are excellent types and, though of comparatively small dimensions, are indicative of the glaciers of the entire region. His report of his investigations published by the Smithsonian Institution, previously referred to, deals with the subject in full detail and in a more technical manner.

The area dealt with is infinitesimal as compared with the immensity of the whole. In the mountain belt of Western Canada, comprising the northern portion of the North American Cordilleras and, roughly speaking, 1,200 or more miles in length by 300 or more miles in width, there is to be found an endless array of glaciers of the various types referred to by Dr. Sherzer, embracing many of much larger dimensions and functioning under conditions of climate that vary considerably.

During the survey of the boundary between the Provinces of Alberta and British Columbia now in operation, which boundary lies for more than half of its length along the watershed of the Main Range—the continental watershed—the writer, who is in charge of the topographical map work as boundary commissioner for British Columbia, has had occasion to survey this watershed. He has had to traverse its length from the

49th parallel of latitude, the northern boundary of the United States, to some distance north of Mt. Robson in latitude about 53° 10′, an interval that practically covers the most accentuated portion of the mountain belt until the mountains of the Yukon and Alaska are reached. He has, therefore, seen and mapped a very considerable extent of this highly glaciated area.

In the Main and Selkirk Ranges there are no glaciers of the alpine type of large size, that is, in comparison with corresponding glaciers of the Alaska-Yukon mountains, where their length may be anything up to thirty or forty miles or more.

The glaciers of the Yukon are dealt with in a separate report by H. F. J. Lambart, D.L.S. (member of the Alpine Club of Canada) who had charge of a photo-topographical party when the survey of the Alaska-Yukon Boundary was being made. Mr. Lambart has kindly provided an exhibit of maps and panoramic views for the Congress, which are on exhibition and which will help materially to a better understanding of the subject.

Selkirk Glaciers

In both the Main and Selkirk Ranges a profusion of small glaciers are found in every direction. This is particularly the case in the Selkirks, owing to the very suitable climatic conditions. It is the first of the high ranges of the southern part of the Canadian system to intercept the moisture-laden winds from the Pacific Ocean. Although the Coast Mountains, the high Fraser Plateau and the Monashee Mountains intervene their extreme altitude is not much over 8,000 feet above sea level, while that of the Selkirk Mountains rises to over 11,000 feet.

At the summit of the Selkirks the average yearly snowfall is about 35 feet and has been known to reach as high as 50 feet for a particular year. This heavy

snowfall produces a most wonderful array of glacier effects and hanging and cliff glaciers clothe the sides of the mountains with a confusion of broken icefalls, tumbling in every direction from their very summits. There are, also, innumerable small-sized basins filled with snow, névés or snowfields as we call them, which discharge their overflow by one or more glaciers of the alpine type, referred to by Dr. Sherzer.

As an example may be mentioned the Illecillewaet Névé at the crest of the range, close by the Canadian Pacific Railway at Glacier Station, which contains ten square miles of snow area and discharges its overflow by the Illecillewaet and Geikie Glaciers; also the Deville Névé, likewise at the crest of the range, a short distance farther south. The Deville Névé contains 15 square miles of area and discharges its over-flow by the Deville, Bishops, Black and Grand Glaciers, the first and last presenting truly magnificent icefalls. These main discharges, along the length of their courses, are fed by numerous cliff and hanging glaciers that line the sides of the mountains enclosing their valleys.

Owing to the rock formation of the Selkirks—chiefly quartzites and mica schists—the valleys are, as a rule, deep and narrow and their sides very precipitous. The tributary glaciers, therefore, have the appearance of falling from directly overhead and, in conjunction with the ice streams below, provide an aggregation of ice and snow that is most spectacularly beautiful. The accompanying portion of one of the Selkirk maps will give an idea of the arrangement, in so far as a map can do. A full copy of the map is among the Club's map exhibits at the Congress.

A most particularly striking feature of the Selkirk glaciers, and the same applies although not so forcibly to the Main Range, is their wonderful purity and white-

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MAP OF PART OF THE SELKIRK RANGE MADE 1901-2
(From Surveys by Arthur O. Wheeler, F.R.G.S. Scale 1 : 250,000)

ness, due doubtless to the vast quantities of snow falling yearly.

On account of the heavy precipitation the valleys of the Selkirks are clad with a very dense forest growth of fir and cedar, of which the trees reach a size up to four or five feet in diameter; beneath lies a thicket of almost impenetrable undergrowth, where the sharp-spined devil's club, *fatsia horrida,* is rampant and fallen tree trunks give a very steadfast opposition to progress up the mountain sides or along the valley bottoms. This difficulty of approach is one of the main obstacles encountered by mountaineers in the Selkirks.

Extreme timber-line is found at 7,300 feet above sea level and many of the main glaciers extend downwards for more than three thousand feet below it before they reach the point of dissipation through melting. In a corresponding latitude in the Main Range extreme timber-line is found at 7,800 feet and gradually decreases in altitude as progress is made northward.

Glaciers of the Main Range

The Selkirk Mountains lie contiguous to the Main Range of the Rockies on its west side and are only separated from it by the deep and broad trough of the Columbia River. Although so close the conditions are quite different, owing to the difference in climate and in rock formation. An interesting report has been presented to the Congress by Professor E. M. Burwash, of the University of Manitoba (a member of the Alpine Club of Canada) dealing with geological construction and physiography of the Main and Selkirk Ranges, which will doubtless explain the geological distinction.

Climatic conditions are quite different, owing to the great bulk of the precipitation having been deposited on the Selkirks in the form of snow, and consequently the annual snowfall is much less and the climate drier in the

Main Range, followed by a more open growth of forest with trees of smaller size. On the eastern slopes the undergrowth is sparse and on the western far less dense than in the Selkirks. Where, in the Selkirks, fir and cedar trees of four feet or more in diameter abound, and the way is impeded by dense undergrowth and fallen tree trunks, in the Main Range slopes are clad principally with pine and spruce, rarely reaching to three feet in diameter, and the forest is fairly open, giving easy access to the heights.

Glaciers are seen at less frequent intervals and are of greater size. Here are seen, most noticeably along the crest of the range, many instances of the ice-cap glacier, referred to by Dr. Sherzer. Doubtless they are relics of the glacial period, when the whole range was covered with ice and only the tops of the highest peaks protruded above it.

Here, also, owing to the difference of the rock formation—which in the Main Range is composed for the most part of limestones, sandstones and conglomerates—huge basins have been eroded along the summit of the range, creating ice-fields of wide extent, sending down alpine glaciers on all sides. Moreover, great amphitheatres have been carved out in which the ice and snow are piled up in fantastic form and incessantly added to by avalanches from the overburdened heights. The name of such instances is "Legion" and a few examples will suffice:—

The Waputik Icefield, lying on the east side of Yoho Valley, directly north of the Canadian Pacific Railway near Field, B.C. (see sheet No. 16 of the map of the Boundary between Alberta and British Columbia, among the map exhibits at the Congress). is roughly 20 square miles of ice and snow, and discharges five main glaciers of the alpine type; it lies at a mean altitude of 8,500 feet above sea level.

The Wapta Icefield, not far north of the Waputik, is approximately 25 square miles of ice and at a mean altitude of 9,000 feet. It discharges six main alpine glaciers. A map showing a survey of the Wapta Icefield, made by the writer by photo-topographic methods, is appended hereto.*

Farther north we have the Freshfield Icefield, at a mean altitude of 8,000 feet above sea level, which discharges one main alpine glacier and, with its confluent glaciers, comprises an area of 20 square miles.

The Lyell Icefield, at a mean altitude of approximately 9,000 feet, has an area of 38 square miles and discharges eight main alpine glaciers.

As a final example may be quoted the great Columbia Icefield which, with its various ramifications, contains approximately an area of 110 square miles of ice and snow. It lies at a mean altitude of about 9,500 to 10,000 feet above sea level and discharges some twenty or more alpine glaciers, many presenting spectacularly beautiful icefalls. Several of these are broad rivers of ice forming the heads of such large and well known waterways as the Saskatchewan, Columbia and Athabaska Rivers, of continental importance. Mt. Columbia (12,229 feet above sea level), the second highest peak of the Main Range, rises from the northern edge of the icefield.

The Columbia Icefield lies in latitude 52° 10′ and nearly half-way between the Canadian Pacific Railway and the Grand Trunk Pacific Railway, both of which are transcontinental lines from the Atlantic to the Pacific Ocean. Although an endless array of similar icefields stretches north, south, east and west from it, varying only in extent, in altitude and in the number of outflowing glaciers, it may be said to be the climax of the ice and snow deposits of the Main Range. While its confines

*See Canadian Alpine Journal, 1907 issue, p. 152.

have been fairly well established by the Inter-provincial Boundary Survey, it still presents a field of worthy alpine endeavour and a complete and more detailed exploration and mapping of it, by those who can read the story, will disclose the glacial history of the range.

In the exhibit of photographs by the Alpine Club of Canada will be found views of such great snow areas, which constitute the natural reservoirs for the main water supply of the Dominion of Canada.

North of the Grand Trunk Pacific Railway, about ten miles as the crow flies, is another climax of snow and ice, centering around the fine massif, Mt. Robson (13,068 ft.), the highest summit of the Main Range. Here is no wide spreading icefield, but all the faces of the mountain except the north, where it is too steep for it to lie, are clad with ice, and snow is piled up in huge amphitheatres on all of its sides except the west, where precipitous terraces of rock hold sway. Mighty glaciers fall from great heights on every side: One, Tumbling Glacier, on the north side, falls over 5,000 feet sheer to Berg Lake, where it buries its nose in the waters of this beautiful blue-green tarn. Frequently great blocks of ice break off with reports like thunder and fall into the lake, sending up water-spouts thirty or more feet high and filling the lake with miniature icebergs.

Glacial Amphitheatres

Huge glacial amphitheatres of specially striking proportions are of frequent occurrence. Two in particular may be mentioned as of more than usual interest: one lies on the east side of Mt. Assiboine, of which views are in the exhibit of photographs at the Congress; the other is on the east side of Mt. Robson, the source of the Robson Glacier. Here are two very pronounced examples of mountain physiography:—

In the first, the Assiniboine case, the glaciers forming on the eastern side of the mountain have gradually

created for themselves a hugh circular basin, containing three beautiful and highly colored lakelets. The overflow from this basin has carved a passage through the original wall of the continental divide, and thereby the watershed has been deflected from its general southeastern course for a depth of nearly four miles around the rim of the basin and over the summit of the mountain, which is a peak of the Great Divide.

In the second case—the Mt. Robson Amphitheatre—the Robson Glacier flowing from it has two lobes or tongues separated by a rock nub, or *nunatak*, now at the extreme fore-foot of the glacier and heaped over with morainal detritus. From observations made by explorers at various intervals it has been proved that at one time all the outflow from the glacier went westward to the Pacific Ocean and that at another time it all went northward to the Arctic Ocean, on the opposite side of the continental divide. To the writer's knowledge, while the main flow went westward to the Pacific, a portion from the eastern tongue of the glacier went northward to the Arctic. It leaves the true position of the continental watershed a matter of doubt; for, should all the flow go northward, Mt. Robson would be a peak of the Great Divide and, should it go westward, Mt. Robson would be several miles within the Province of British Columbia; should, however, the flow be divided and part go each way, the watershed would lie up the centre of the Robson Glacier. The question is: where does the watershed properly lie?

Glacial Features

The glaciers of the Selkirks and the Main Range are of delightful interest, and particularly so to the scientific explorer, owing to the manifold features in which they abound: crevasses, séracs, ice grottos, moulins, glacier tables, sand cones and in many cases there are large ice caves at their snouts from which rushing muddy torrents

make an exit and pour swiftly down the valleys. Icefalls are everywhere and are of wonderfully broken and spectacular appearance.

Many of the glaciers show fine combinations of the Forbes dirt bands in graceful fan-shaped curves; two cases in particular come to mind: the Deville Glacier and the Chaba Glacier, where the terraced formation of the former and the latter like a beautiful white feather are particularly striking.

Moraines, lateral, medial and terminal, are very much in evidence. In the case of lateral moraines they are seen rising as much as 300 feet above the level of the ice, giving visible proof of the great shrinkage that has taken place.

Dr. Sherzer's reference to the *bear-den* moraines, as he styles them, is of interest. The writer has seen all the examples referred to by him and others of a similar nature in the same section of mountain area. He does not, however, recall instances of the kind in the section of the mountains north of the Canadian Pacific Railway, except possibly at the extreme head of Yoho River east of Yoho Glacier, though, doubtless, such exist.

Dr. Sherzer's theory of earthquake disturbances as a reason for their occurrence seems to be borne out by other facts. As an instance may be mentioned the upper valley of Simpson River, which of necessity must carry the outflow from the glaciers lying on the north side of Mt. Assiniboine. Directly below Mt. Assiniboine, on that side, is a beautiful glacial lakelet—Lake Magog—a mile long by half a mile wide. There is no visible outlet to the lake. For seven miles one may travel from the lake down the Simpson Valley and find no stream indicating such an outflow; then springs are seen and a good sized stream is soon in evidence.

The floor of the valley for four of the seven miles is broken by great hollows separated by immense partitions

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A. O. Wheeler, Photo, 1902

THE DEVILLE GLACIER, SELKIRKS, B.C., FROM SUMMIT OF MOUNT FOX

Showing Formation of Forbes "Dirt Bands"

of piled up masses of rock débris and humus, grown over with forest that has in places been swept by fire. This stretch of the valley is desolate in the extreme; huge blocks of rock have been piled up and hurled here and there in such wild confusion that it is known by the name of the "Valley of the Rocks," and is truly the "abomination of desolation." The writer can conceive of no force except an earthquake that would produce such a condition of things and, in his opinion, that is what has happened, and the entire bottom of the valley has been loosely filled in, the outflow of the northern Mt. Assiniboine glaciers lying beneath the piled-up débris. The trend of the valley is northwest and southeast, so that the conditions would strongly support Dr. Sherzer's theory.

Still another instance may be found in support of the earthquake theory: In the valley of Cougar Brook, a few miles from the Illecillewaet Glacier—one of Dr. Sherzer's best examples of the bear-den moraine — are a series of underground passageways, more than a mile in extent and several hundred feet below the surface. They are known as the Caves of Cheops and are due to Cougar Brook vanishing into the ground and carving out for itself a set of subterranean channels at various levels. The writer explored and surveyed the series for the Government and, in certain places, found the passage floors piled up with broken rock blocks that appeared to have fallen *en masse* from the roof. It is difficult to understand the action that would create such a wholesale massing of fallen rock unless through the agency of a seismic convulsion; the more particularly that the action of frost does not appear to be a factor, for when the writer was there it was twenty degrees below zero above the surface and yet the temperature was mild and pleasant in the subterranean passageways.

Glacial Lakes

The vast number of glaciers has given rise to a feature of the Main Range that is particularly striking. The writer refers to the very many and wonderfully beautiful glacier lakes that have been created and are held in place by glacial action and morainal deposits. They are seen in every direction, scintillating like gems amidst the deep green forest or high up above timber line in rocky basins bordered by ice and snow. Their colours are exquisite and vary through all shades of blue and green, from cerulean blue to turquoise green and brilliant sapphire to deep emerald. They have even been noticed a bright chrome yellow. The exquisite colouring of these glacial tarns is the wonder of the Canadian Rockies and adds greatly to their scenic attractions. From the summit of a high peak it is quite common to see a dozen or more scattered over the surrounding landscape. Strange to say, they are not often met with in the Selkirks and are there rarely to be seen.

Observations of Glaciers

Very little has been done in Canada with regard to systematic observations of the movement and action of glaciers. Such as have been made show that all the glaciers are retreating and shrinking rapidly as measured by geological time. There may possibly have been minor advances in isolated instances, due to local conditions, but such are of no importance in the general result. The reason is apparently owing to a very gradual change to milder climatic conditions extending over the North American Continent, due to causes that do not appear to be clear. The only precise studies of the glaciers of the Main and Selkirk Ranges are the restricted ones made by Dr. Sherzer, previously quoted, and some of whose statements have been here given. Apart from these observations of any definite value may be summed up as follows:—

With two noteworthy exceptions the observations for movement and change, through a series of years, made thus far have been so casual as to be practically of no value. The exceptions are: Those by George and William S. Vaux, members of the Academy of Natural Sciences of Philadelphia (active members of the Alpine Club of Canada); and by the Alpine Club of Canada.

Three glaciers were subjected to systematic observation for recession of the ice forefoot and for the rate of flow by the Messrs. Vaux during a series of years, viz: the Illecillewaet and Asulkan Glaciers in the Selkirks, and the Victoria Glacier in the Main Range.

Illecillewaet Glacier

August 17th, 1898, the farthest advanced point of the ice forefoot was 60 feet from a deeply imbedded boulder,* shown marked "C" on the accompanying map. On July 24th, 1906, it was found to be 327 feet from the same boulder.

Subsequent to 1906 the observations were carried on by Miss Mary M. Vaux (member of the Alpine Club of Canada) sister of the gentlemen named. According to the last report received from her, the distance from the rock "C" to the nearest part of the forefoot, on the 19th of July, 1912, was 615 feet. Since then the ice has receded very considerably and the forefoot has shrunken greatly in size and spectacular appearance.

The average maximum flow during the period 1898 to 1912 is shown to be approximately five inches per day.

Asulkan Glacier

August 12th, 1899, a rock in line with the farthest advanced ice of the forefoot was marked . August 8th, 1900, the ice had receded 24 feet. August 6th, 1901, the ice had advanced 36 feet. July 23rd, 1906, the ice was

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*See Canadian Alpine Journal, 1907 issue, p. 148.

again in line with the rock; that is in the same position as in 1899.

Subsequent observations by Miss Vaux show that between August 20th, 1909, and July 27th, 1912, the ice had retreated 259 feet from the marked rock. During that interval the observations on August 9th, 1911, show that the ice had again advanced 51 feet.

Victoria Glacier

The Messrs. Vaux state that the recession of the Victoria Glacier between 1898 and 1903 appears to have been about 17 feet annually, or about 85 feet for the five years.

Subsequent measurements by Miss Vaux show that between August 20th, 1909, and August 7th, 1912, the ice retreated 43 feet. The small amount of recession as compared with the other glaciers is probably due to the fact that the whole lower part of the ice forefoot is covered by morainal matter and is thereby protected, to a considerable extent, from melting.

Yoho Glacier

Messrs. Vaux state that the recession of the ice tongue from 1901 to 1904 was 89 feet, and that from 1904 to 1906 the ice apparently was stationary.

In 1906 the Alpine Club of Canada began a systematic series of observations and measurements of the Yoho Glacier of which the results have been published yearly in the Canadian Alpine Journal. A row of metal plates, at approximately equi-distant intervals, was placed across a comparatively uniform slope of the ice forefoot from margin to margin. Attached to this report is a map showing the results of a photo-topographic survey of the Wapta Icefield by the writer, in which icefield the Yoho Glacier has its source.*

*See Canadian Alpine Journal, 1907 issue, p. 152.

In 1907 the writer mapped the forefoot of the glacier by photo-topography. The attached map shows the result. It also shows the line of plates set across the ice in 1906 and the movement of such plates from July 15th, 1906, to July 17th, 1907.*

From July 15th, 1906, to July 30th, 1918, the retreat of the forefoot has been 444 feet, and the average maximum daily movement of the plates set across the forefoot has been 3.06 inches.

The observations were discontinued in 1918, owing to the great shrinkage of the forefoot and the fact that the only available portion of the ice had become so crevassed that setting out the plates was impracticable. Further, the ice by its shrinkage has produced an obstacle in the form of a deep rock gorge, holding a rushing torrent, which cannot be crossed. The gorge until last summer was beneath the ice which formed a bridge across it.

Robson Glacier

As already stated in this report, the forefoot of the Robson Glacier consists of two lobes or tongues separated by a rock nunatak now covered by a morainal detritus. On August 10th, 1911, the writer marked a rock and measured to the nearest ice of the eastern tongue, 338.6 feet. He also marked a rock and measured to the nearest ice of the western tongue, 175 feet.

On August 9th, 1913, he again made the measurements. The distance from the marked rock to the nearest ice of the eastern tongue was found to be 367 feet, or a retreat of 28.4 feet; to the nearest ice of the western tongue it was found to be 206 feet, or a retreat of 31 feet.

The latitude of Robson Glacier is approximately 53° 10′ and that of the Yoho Glacier, the most northerly of the four others, is approximately 51° 30′. The annual

*See Canadian Alpine Journal, 1908 issue, p. 274.

snowfall in the Mt. Robson district is very much heavier than in the district where the other glaciers are situated.

The foregoing examples are typical of all of the glaciers of the Main and Selkirk Ranges of the alpine type, and they provide every indication of a steady retreat and consequent shrinkage, which is only varied by minor advances entirely due to local climatic conditions for a particular year.

An inspection of the views placed on exhibition at the Congress will convey a very fair idea of the nature and extent of the glaciers of the Canadian Rockies.

In an accompanying report by Mr. H. J. Lambart, the glaciers of the Yukon-Alaska mountains are dealt with and illustrated by photographs and maps on exhibition at the Congress.

REPORT SUBMITTED

TO

THE ALPINE CONGRESS AT MONACO

FROM

THE ALPINE CLUB OF CANADA

NOTES ON THE KLUTLAN GLACIER AND GLACIERS OF THE PACIFIC COAST RANGES THROUGH CANADA AND ALASKA

By H. F. J. Lambart.

The scope of this short paper is mostly confined to observations and studies derived from one summer spent on the Klutlan Glacier, which crosses the International Boundary Line eighty miles north of Mount St. Elias—the "corner stone" of the Canada-Alaska Boundary Line.

Slide No. 1.—Mt. St. Elias, looking south across the interior snow piles.

To avoid an overburden of generalities in attempting a paper touching on all glaciers visited by the writer, which generalities are likely to be common to the glaciers of Europe, this one example has been selected as, together with what it has common to all glaciers, there are several features which in themselves cannot fail to be of some interest. After a short account of personal experiences gained while engaged in delimitating a part of the boundary in the region of the Mt. St. Elias Alps, the writer will pass on to a short account of the most important glaciated areas of Alaska, shown in the accompanying lantern slides.

THE KLUTLAN GLACIER

This glacier is noted for its several phenomenal characteristics. It has its source in glaciers on the American side of the boundary which join the main stream close together near its head like the fingers of a hand. These glaciers have never been explored and still remain unknown and unmapped save for one or two lofty peaks whose positions have been fixed by readings taken from peaks adjacent to the boundary.

Within quite recent times an eruption of some not far distant volcano has covered the country with volcanic dust and immense quantities of pumice stone. This eruption is sufficiently remote, however, for the glaciers to have cleared themselves; that is to say, the ash which has fallen on the glaciers and snow fields at the heads is now completely deposited at the terminals, which in the case of the Klutlan covers all the lower end. The depth of this deposit is shown on many vertical banks—where the glacial streams have worn their way through—to be as much as 50 feet thick. Superimposed upon these immense beds of pumice stone there has formed a layer of earth or loam upon which a dense growth of small spruce timber is growing luxuriantly. This forest covered tongue of the glacier is thirty square miles in extent. As one proceeds up the glacier the forest growth gradually dwindles and finally gives way to stretches of open wastes of ash, piled and pitted into every conceivable shape. Innumerable round pot holes and elongated ones are visible—filled with water; these evidently represent ancient crevasses which are preserved in shape to some extent from the summer sun by the blanket of volcanic ash. Beyond this the layer of ash is much thinner and banded into semicircular waves; and lastly, a wonderful display of twisted buckled moraines stretches out for three or four miles, indicating

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Photo, H. Mussell MT. ST. ELIAS (18,000 FT.) *Slide No. 1*
Looking Across the Interior Snowfields

Mt. St. Elias (18,000 ft.) Mt. Augusta (14,070 ft.)

Photo, H. Mussell MT. ST. ELIAS—AUGUSTA RANGE *Slide No. 9* *(see p. 153)*
Looking North

a gradual slowing down and coming to rest of the great moraines with their burdens of débris.

The velocity of flow of the glacier is not known, as it has very seldom been visited and no attempt has been made to establish marks in the ice whose displacement would be observed by means of reference marks on the margins. The writer visited a section of the Klutlan Glacier in 1909 and again in 1913, and after this lapse of four years not a single recognizable feature of the old glacier remained. The glacier in its entirety had greatly sunken, indicating a distinct retrogression.

The glacier is fed throughout its length by many tributaries, several of which take their source from lofty peaks of the district. Mt. Natazhat (13,440 feet), climbed in 1913 by the writer and party, is on the north side of the glacier, three miles on the American side of the boundary.

Slide No. 2.—Mt. Natazhat, looking north across Klutlan Glacier.

Mt. Wood and Mount Bear are on the south side, rising to elevations of 15,880 feet and 14,850 feet respectively, while Mt. Bona raises its lofty snow-capped summit of 16,420 feet in the midst of the branches of the upper sources of the glacier. The Klutlan Glacier, in its main trunk, is from two to four miles wide, heavily crevassed, mostly throughout its lower part, while very smooth in extensive stretches of its upper portions.

The burden of débris carried by its moraines is thick for long stretches and then again becomes quite thin, but in either case maintains the same width for miles at a stretch and only varies when interfered with by cross currents of ice joining the main trunk by small feeders. The central moraines reach 100 yards in width, while the laterals are usually much wider. The moraines have

protected the ice and, in consequence, are all elevated above the level of the general surface.

Slide No. 3.—Camped on the Central Moraine of the Klutlan—directly opposite Mt. Brooke.

Common to all the glaciers of the region some very large streams cut their way for miles—in deep sunken channels having a predilection for skirting the moraines —and generally end up suddenly by dropping into a vertical ice shaft, the water in such manner finding its way to the depths of the glacier. This is shown clearly on the map in the case of the one large stream on the Klutlan Glacier.

The volcanic ash previously referred to, which is generally spoken of as "scoria," is very light and spongy when dried out, and floats in great quantities down the glacial streams after a freshet.

In connection with the delimitation of the boundary much supplies and equipment were moved up this glacier. When covered with snow, during the latter part of May and part of June, it made splendid sledding for dog teams and walking for members of the party carrying packs or pulling the Yukon sled or toboggan. The very early mornings before sunrise found the snow surface generally hard and splendid for travelling.

Before leaving the description of the glacier mention should be made of a phenomenal moraine formation shown on the south side of the glacier between the letters "G" and "L" in the word "glacier" on the map. This moraine consists of four long sharp-edged ridges running along parallel to one another and terminating in a dull rounded end shown immediately below "L" in the word "glacier." It appears as if a slide or something of that sort had taken place, up the Nesham Glacier and that the extent of its journey so far was measured by its present position on the main glacier.

Mt. Natazhat (13,440 Ft.) Mt. Brooke

Photo, H. J. Lambart *Slide No. 2*

MT. NATAZHAT
Looking Across Klutlan Glacier at 6000 Ft.

Photo, H. J. Lambart *Slide No. 3*

CAMPED ON CENTRAL MORAINE OF THE KLUTLAN GLACIER

Immense talus slopes of shales and hornblendes are found on both sides of the glacier, and frequently these are most beautifully terraced and covered with a delicate verdure which in midsummer gives them the appearance of well kept bowling greens. They are always kept closely cropped by the numerous wild sheep of the district (*Ovis Dalli*). Several tracks of the Alaska brown bear were seen along the margin of the ice. Three of these bear were encountered all at the same time one morning in the brush near the toe of the glacier. Willow ptarmigan were found in great abundance as far as "L" in the word "glacier" on the map; beyond this the smaller variety, known commonly as "Rock" ptarmigan were frequently met.

Clear weather conditions are more frequent here, generally speaking, than is usually the case amongst the mountains directly on the coast. The season for practical alpine work is sadly short—from the middle of May to the first week in August. After the middle of August heavy snowfalls can be expected all over the lower glaciers. Snowfalls on the peaks, of course, can be expected at all times. A pole ten feet high was placed on the summit of Mt. Natazhat (13,440) on the 8th of June, 1913, when the writer with a small party made the ascent, but two days later, when the peak appeared clear, no signs of the pole were visible; it had been entirely snowed under—and yet we quarrel about 25 feet difference in the elevation of a high snow summit obtained from two different observers.

The district is difficult of approach. From a general map of the Yukon and Alaska it will be seen that the shortest and best route is by steamer from any port in Puget Sound, as Vancouver or Victoria, up through the Pacific Coast archipelago of islands, one thousand miles to Skagway at the head of the Lynn Canal. Thence by the White Pass and Yukon Railway over the coast range

to Whitehorse, the head of navigation of the Yukon River.

A wagon road branching from the Whitehorse-Dawson road, at a point just beyond Tahkeena, leads to Lake Kluane. The head-waters of the White River (shown on the north end of the map) can be reached from Kluane by sled in winter or pack train during the summer.

The following schedule shows the time that would be expended on such a journey:

	Days	Miles
From Vancouver to Skagway.....	4	1,000
Skagway to Whitehorse	1	110
Whitehouse to Tahkeena	1	12
Tahkeena to Lake Kluane	5	84
Lake Kluane to the foot of the Klutlan Glacier by way of Harris Creek	5	96
	16	1,302

Slide No. A.—Valley of the Dezadeash on the Whitehorse-Kluane trail. Other portions of the map generally described.

The Logan and Chitina glaciers, although not visited by the writer, possess many of the characteristics of the Klutlan with one marked exception, that being the absolute absence of the scoria or volcanic ash. The stream lines or moraine flows on these glaciers have been carefully plotted and shown very closely to their true position. The moraines on the glaciers springing from the foot of the high mountain mass of Mt. Logan are all summer long buried in snow and in consequence none can be shown.

Mt. Logan Mt. King

Photo, Dennis

MT. LOGAN (19,850 FT.) AND MT. KING (17,130 FT.)
Looking Southeast. Logan and Ogilvie Glaciers in Foreground

Slide No. 4 (See p. 153)

Slide No. 4.—Mt. Logan (19,850 feet), looking southeast. Logan and Ogilvie Glaciers in foreground.

A joint Canadian and American party made an attempt to ascend Mt. St. Elias (18,000 feet) but failed through bad weather, their trail over the glaciers and snowfields being shown. This route to St. Elias is not as hazardous as that taken by H.R.H. the Duke of the Abruzzi, when he made his successful ascent of the peak.

Slide No. 5.—Mt. St. Elias, looking N.W., showing foothills and lower portion of the Seward Glacier.

The Seward Glacier, shown in the southeast corner of the map is the largest tributary glacier of the great Malaspina Glacier, which possesses a sea frontage of 60 miles.

Slide No. 6.—Upper snowfields of the Seward Glacier.

Slide No. 7.—The Malaspina Glacier; looking over the glacier to the sea, 35 miles distant.

The majestic sweep of this immense snowfield is only adequately shown in the pictures taken by the Duke from the summit of St. Elias. As is seen on the map the glacier is confined between the two lofty mountain ranges, Mts. Logan and King on the north, and the Augusta range on the south.

Slide No. 8.—The Seward Glacier as it turns the end of the Augusta Range.

Slide No. 9.—The Mt. Elias-Augusta Range, looking north.

The Columbus Glacier, named by the Duke, "Colombo" Glacier, flows west and southwest and is absorbed into an immense glacier field in Alaska, which up to the present is believed not well known.

Short description of coloured slides accompanying this paper depicts the region briefly described above as well as some portions of the Pacific Coast seen in making the journey from Vancouver to Skagway.

As well, some slides are here shown, trusting they will be of interest in themselves, showing the great glaciers of Alaska on the fiords (fjords) and coast.

Slide No. 10.—Iceberg off the Pacific Coast of Alaska.

Slide No. 11.—Off the British Columbian Coast, Canada.

Slide No. 12.—Log jam in the bed of an Alaskan river—Taku River, Alaska.

Slide No. 13.—Mountains of the Coast Range. Looking out over the Pacific in the neighbourhood of Russell Fjord, Alaska.

Slide No. 14.—Surface of a glacier such as is found in the southwest parts of the Klutlan Glacier; slightly crevassed.

Slide No. 15.—The Chilcat Glacier, Alaska.

Slide No. 16.—Salmon River Glacier, above Nuget Camp, the Salmon River being a tributary of the Klihini River, Alaska.

Slide No. 17.—The Lynn Canal and its outer fringe of low mountains.

Slide No. 18.—The Lynn Canal.

Slide No. 19.—Photograph showing the head of the Glacier Bay, Alaska. The large glacier in centre is the Grand Pacific, and next to it, to the left, is the Johns Hopkins.

Slide No. 20.—The Muir Glacier of Glacier Bay, Alaska, the small one in the centre being the Morse Glacier.

Slide No. 21.—Photograph taken looking over the Grand Pacific Glacier towards the Mt. St. Elias Alps.

Slide No. 22.—Another picture of the Grand Pacific Glacier, showing a marked recession.

Slide No. 23.—Latuya Bay—Mt. Fairweather (15,290 feet) on the left. Northern coast of Alaska.

Slide No. 24.—Glacier at one extremity of Latuya Bay.

Slide No. 25.—Men and dogs packing up a ravine on the margin of the Klutlan Glacier, Yukon Territory, Canada.

Slide No. 26.—Shows the rolling country of the interior of the Yukon and Alaska. The 141st Meridian marked by a vista 20 feet wide cut through the timber. This is the straight line International Boundary, commencing at Mt. St. Elias and running north 600 miles to the shores of the Arctic Ocean.

Slide No. 27.—Another view showing the timber-blanketed interior plateau of the Yukon and Alaska. The Valley of the "Forty-mile" river shown, being one of the earliest glacier gold-bearing streams of the Yukon. The international boundary crosses the territory shown.

Slide No. 28.—Rampart House, a trading post on the Porcupine river where the 141st Meridian crosses that river. This point is well inside of the Arctic Circle. Pack trains were operated from this point through to the shores of the Arctic Ocean when the survey of the boundary was being made.

REPORT SUBMITTED
TO
THE ALPINE CONGRESS AT MONACO
BY
THE ALPINE CLUB OF CANADA

CLIMATOLOGY OF THE MAIN RANGE AND THE SELKIRKS, ROCKY MOUNTAINS OF CANADA, ALONG THE LINE OF THE CANADIAN PACIFIC RAILWAY

By N. B. Sanson

From the entrance to the Rocky Mountains on the main line of the Canadian Pacific Railway, at a station called Kananaskis, Alberta, and on to Revelstoke, British Columbia, will be considered as the location which is to come under treatment in the way of climate. The distance is 207 miles.

The Meteorological Service of Canada has maintained weather stations at Banff in Alberta and at Golden, Glacier and Revelstoke in British Columbia for a number of years.

At Lake Louise, Alberta, a few years of interrupted work has been done and is now being more systematically attended to.

At Donald, B.C., from 1893, a few years of weather recording was attempted, but this station has been for many years off the list.

In sparsely settled districts it is not always possible, for several reasons, to get or retain observers.

At all stations outside Banff there have been some breaks in the records and one would liked to have had records from other points along the line.

All the weather stations mentioned outside Banff are called second class.

The instruments in use are self-recording maximum and minimum thermometers — Fahrenheit (Negretti & Zambra, makers) — and rain gauge. Where regular observations are taken of extremes of temperature, the state of the weather, rainfall and snowfall, at local times some other observations, such as clouds, wind, etc., are made. Wet bulb thermometer and phenomena may also be recorded at some few points.

At Banff, altitude 4,530 feet, records run from about 1887 to 1896 with some breaks, and from 1896 records have been regularly kept to the present time. The instruments in use at Banff are: mercurial barometer, barograph, ordinary and wet bulb thermometers, thermograph, hygrometer, maximum and minimum self-recording thermometers (all Fahrenheit readings) and rain gauge. Observations are taken at 6 a.m. and 6 p.m. local time. Banff is a more or less special station but not a first-class station.

In connection with Banff, a mountain station is maintained. This is on the top of Sulphur Mountain, which faces the town. The elevation is about 7,500 feet above mean sea level. Here a stone building 12x14 feet by about 10 feet in height, was built in 1902-3.

Trestles running from inside the building and up to about 10 feet outside are covered with a platform on which rests a large and very heavy iron anemometer pillar with arms and cups.

A good trail leads from the Upper Hot Springs—2¼ miles from the town—to the building; this has twenty-eight traverses and is approximately four miles in length.

The trail is four to six feet wide and horses can easily ascend.

The instruments in use at present at this building are the ordinary thermometer, maximum and minimum, thermograph and barograph, also mercurial barometer.

In 1903 a lead cable with eleven insulated wires was strung, connecting with the Banff Government Museum Building below, where the wind was recorded on an anemograph. Records were thus obtained from the fall of 1903 to the early part of 1911, with occasional interruptions from one cause or another, and for a time the temperatures were recorded in the same way. It was intended to have installed a barograph giving results at Banff but a very severe electrical storm, combined with several less severe storms, damaged the interior of the cable and, although repairs were made, it was found impossible to keep up receiving results from this mountain station until a heavy copper wire could be strung from the building to the nearest water damp ground—one-quarter of the way down the mountain and some distance from the building. This could not be done until a few years ago and now there is a possibility of having proper repairs made and our being in a position to again receive wind records, which are most important in studying the weather in the mountains.

The large iron anemometer was a great attraction for lightning. Sulphur Mountain is a very dry limestone mountain and ground wires proved useless.

This building is connected by telephone with the central telephone office at Banff, and in dry summer seasons a fire warden is stationed in the building to be on the lookout for forest fires.

The station is visited fortnightly throughout the year and the record forms collected, in summer on foot, occasionally on horseback, and in winter on snowshoes.

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Photo, D. McCowan

GOVERNMENT OBSERVATORY ON SULPHUR MT. AT BANFF
At 7455 Ft. Above Sea Level

It has been part of the writer's duty, as Meteorological Observer at Banff, to take these trips. Originally the trip was taken every week for a number of years, commencing 1903. The tramps have been continued regularly in all sorts and conditions of weather and have given one a very good idea of weather conditions on the mountains at all seasons. Taking it throughout, many pleasant trips have been enjoyed winter and summer while on this work, and many very fine sunrises and sunsets, auroras and cloud effects, etc., have been seen. The Auroral Arch has been seen to perfection and the Chinook wind band in the eastern horizon, and a rare and peculiar light green tint of horizon that seems often to precede a Chinook.

To close this portion of the article in hand, I may say that after any specially trying trip it has given one the utmost feeling of contentment to be sitting inside the building, enjoying the warmth of a coal fire and a good cup of snow-water tea. It is foolish for anyone to take trips of this nature alone in winter without they have some experience and are prepared for all conditions of weather, for they may overlook some small detail and suffer thereby. One strong young fellow, about a year ago, had both feet badly frozen. Another person I met on the top, at dusk, was falling about in the snow with his hands in bad condition.

General Climate of Main and Selkirk Ranges

Before giving a more detailed account of the climate of the different sections of the district in hand, the main features of the climate of the whole will be dealt with.

The general nature of the climate of the mountains, from the entrance to the Rocky Mountains at Kananaskis in Alberta, and along the line of the Canadian Pacific Railway to Revelstoke in British Columbia, a distance of 207 miles, taken as a whole tends from moderately cold to cold, and from moderately long to

long winters, and temperately warm summers. The temperature gradually becomes lower as the altitude increases, to again rise somewhat over the summit of the Rockies (altitude 5,332 feet, which is near Stephen, B.C.), so that at Field (altitude 4,072 feet), on the west side of the summit, temperatures are slightly higher than at Banff. At Golden, B.C. (altitude 2,583 feet), which might be taken as the western limit of the Rockies along the line of the railway (or at the foot of the Rockies), and in a more open situation in the Columbia Valley, the weather is warmer in summer and nearly as cold in winter as Banff, with visits from the Chinook winds. Donald (altitude 2,579 feet), west of Golden, and on to Beavermouth, are of about the same temperature as Golden, but have very little wind. As the altitude again rises to the summit of the Selkirks (present altitude 3,801 feet)—the Connaught Tunnel, five miles long, here reduces the grade by 539 feet—and at Glacier and vicinity, the values of the temperatures in winter are higher, and in the summer are somewhat lower than Banff. At Revelstoke (altitude 1,494 feet), the temperatures are much higher in summer than any other place in the mountains and higher in winter than the majority of places in mountains. Precipitation also increases on the way west to the summit of the Rockies and on to beyond Field. At Golden and Donald, the precipitation is less than at Lake Louise, but from Beavermouth and on the way to Glacier it again increases. At Glacier the precipitation is very heavy, the greater amount being made up of snow, for at Glacier and vicinity more snow falls than at any other place in Canada. At Revelstoke precipitation is heavy but not nearly so much so as at Glacier, and rain makes up the greater part of the total amount, the snowfall being somewhat the same as at Lake Louise.

The seasons vary considerably in a given number of years. There may be a few exceptionally mild winters

and a few exceptionally cold winters, a few exceptionally warm summers and a few exceptionally cool summers, a few exceptionally fine spring seasons and a few exceptionally cool and backward springs, a few exceptionally mild and fine falls and a few exceptionally early and cold falls, as well as a few dry and wet summers and a few exceptional winters of light and heavy falls of snow, and then all the variations possible between these forms. Every year has some peculiarity of its own; every season has some peculiarity of its own; every month has some peculiarity of its own.

The range of yearly temperature seems to remain much the same for any place, being perhaps more consistently the same at Glacier than anywhere else. The mean average temperature of most places does not vary so very many degrees. The rain and snowfall does vary considerably. In phenomena, auroras vary very much in number. Thunderstorms also vary much in number; so do Chinook winds. Solar and Lunar halos vary considerably in numbers seen. Gales may be particularly severe in one or two years, of many years' time.

As a general rule, after what might be called the limit in dryness or excess of moisture has been reached in a number of years, the next year will commence to be more moist or dry, as the case may be, and this will go on with a few ups and downs till another limit is reached. There is no regular number of years apparently for any of these periods, but they do occur. The same holds good in reference to mild and cold limits in winter and warm and cool limits in summer, as well as spring and autumn.

Something after the manner of the fruiting of wild bushes, etc., or seed bearing of our poplar trees, etc., after a limit of exceptionally heavy bearing of fruit or seed (which, of course, is really fruit), very little and

in some cases no fruit will be found the next season; to more or less gradually go on again to a limit. Of course this comparison does not always hold good, for an abundance of fruit may be a sign that the tree will die shortly, but it is not always so. In other words, the limit being reached in one direction the reverse direction is started.

Of frost in the ground the extreme limit is about eight feet at Banff, with a minimum of about eighteen inches. On the mountain slopes the frost does not apparently penetrate very deeply, for a great deal of snow disappears into the ground on the slopes without showing any running water. This is the case also in the valleys, when the ground is covered with snow, before much cold weather has arrived. The valley snow in spring raises the mountain rivers to a certain level but does not necessarily cause very high water, the mountain snow being the cause of flood, combined with heat and rain, or both.

Snow Line

What is the snow line in our mountains? I have seen it mentioned as being 8,000 feet above sea level. May I cast in my lot and say 9,000 feet above mean sea level?

The Aurora

The case of the aurora is apparently unknown. Auroras appear to be, as a rule, more common in the spring and fall. After a warm-like day in spring and fall, followed by a clear frosty night, one can generally count on seeing auroras, the time of commencement depending on the season, but often quite regularly at a similar hour each evening. They generally increase in brilliancy up to about a certain hour in the early morning, perhaps disappearing for a short period, only to start up again with double the brilliancy. We have had all classes at Banff; from the very rare special first class to the very

faint appearance of light, and from the streamer and rolling-curtain variety to the very brilliant flash-light kind, which will suddenly light up the morning before dawn. The first class special occurred way back in January, 1894, at 8.30 p.m. Banff time. In the zenith was a marvellously beautiful corona, crimson, bright and deep, northwest and southeast. The whole heavens were covered and the corona, distinct arches, waves and streamers very brilliant and magnificent. It was a clear and calm night, just below zero.

General Conclusion as to Climate

Though the winters in the Rocky Mountain section may be long and moderately cold to cold, the atmosphere is usually dry and the air invigorating. When low temperatures occur there is usually no wind and the cold is not nearly so much felt as in the much higher low temperatures of Eastern Canada. The snow very seldom approaches slush and the winter snow often falls during the night.

The summers are usually very fine with much bright weather, not excessively warm but temperately so, the temperature very rarely rising to 90°. Outside Golden, where the temperature more often rises to 90° and over, the rainfall is moderate, very often falling during the night. The nights are cool, thereby giving refreshing rest.

The winters usually commence in November and winter conditions continue into March.

Cold snaps usually occur several times during the winter and most frequently follow a snowfall. They generally last three days, when the wind on the fourth day is known to be rising by the snow blowing off the mountains from the west. This west wind in twelve hours, more or less, descends into the valley, at first light, but gradually becoming stronger, during which

the temperature rises. Through the first day it really feels colder than when the temperature was lower; the second day is milder but still the wind is chilly; on the third day there is a marked difference in temperature and feeling.

It is often after a snowfall, when the barometer is rising and the sky clearing, that the temperature drops quickly and reaches its lowest an hour or so after daybreak. For the general run of three days the temperature drops lower each morning. During the spring months the weather may occasionally be set back by snowstorms and consequently cooler weather.

Occasional snowstorms affect the fall — September and October—in the same way, but, nevertheless, there is usually much very fine weather in these months. The snow generally goes off the ground in March, to the east of Banff, about the end of March or first week in April at Banff, about the end of April at Lake Louise and on to Field, about the same time at Glacier and likely by the end of March at Revelstoke.

Kananaskis to Anthracite

From Kananaskis to Canmore, Alberta, the temperatures are about the same, but these places have less precipitation and much more wind than at Banff, receiving more of the Chinook wind.

Exshaw and Kananaskis, not far apart, are extremely windy places, the gap or eastern entrance to the mountains acting as a sort of funnel for west winds' concentration.

Anthracite is more or less of a sheltered valley and has less frost than to the east or west.

Banff, Alberta

North latitude, 51° 10′. West longitude, 115° 34′. Height above sea level, 4,530 feet.

Mean annual temperature, 36.3°. Maximum annual mean temperature, 38.5°, 1911. Minimum mean, 33.5°, 1909.

Mean annual range of temperature, 122°. Maximum annual range, 132°, 1909 and 1914. Minimum annual range, 104°, 1915.

Mean annual maximum temperature, 86.8°. Extreme temperature, 91.0°, July, 1918.

Mean annual minimum temperature, 35.1°. Extreme temperature, 47.0°, January, 1909.

Mean annual daily range of temperature, 21.9° (seven years).

Mean annual rainfall, 12.17 inches. Maximum annual rainfall, 19.49 inches. Minimum annual rainfall, 7.14 inches, 1904.

Mean annual days of rain, 67 days. Maximum annual number of days rainfall, 104 days, 1915. Mimimum annual number of days rainfall, 30 days, 1905.

Mean annual snowfall, 81.9 inches. Maximum annual snowfall, 130 inches, 1916. Minimum annual snowfall, 34.4 inches, 1905.

Mean annual number of days of snow, 61 days. Maximum annual number of days snowfall, 105 days, 1909. Minimum annual number of days snowfall, 46 days, 1915.

Mean annual number of thunderstorms, 10. Maximum annual number, 26, 1915. Minimum annual number, 0, 1909.

Fogs take the nature of low stratus cloud which hide the mountains, but very rarely reach the valley level.

Mean annual relative humidity for Banff, 67.

Usually there is no frost in July, though occasionally frost occurrs during that month. Frost does not always

occur in August, and there has been at least one year when no frost occurred in May, June, July, August and September.

There have been six winter months of below-zero temperature, viz.: January, February, March, April, November and December, but this is rare. More usually there are five below-zero months and occasionally only four below-zero months. In three years there have been about three times when the temperature was from 1 to 5 below zero in October.

Mean annual precipitation, 19.49 inches. Maximum annual precipitation, 30.59 inches, 1902. Minimum annual precipitation, 14.58 inches, 1906.

It will be seen that most of our total precipitation falls in the form of rain in the valley.

Maximum amount of precipitation in twenty-four hours, 1.98 inches.

Maximum monthly fall of snow, November, 1896, 48.6 inches.

Maximum monthly fall of rain, June, 1915, 6.01 inches.

There is generally from 1 foot to 2 feet of snow on the ground in winter. Banff gets a suspicion of the effects of the Chinook wind fairly often and in some years a definitely marked dry Chinook occurs, and less often the wet Chinook.

Lake Louise

The mean temperature is several degrees colder than Banff (6° or more). There is generally from 3 to 4 feet of snow on the ground and there is very little wind, so that the snow does not drift. What wind there is comes either from the west or east, along the railway track.

The Summit of the Rockies

A place for severe snow storms in winter.

Field, British Columbia

Slightly higher mean temperature than Banff. From 3 to 5 feet of snow lies on the ground in winter.

Field gets snow storms from the Yoho Valley to the north. When these storms are on, the flying snow is blinding, otherwise Field practically only has a west wind.

Ottertail, British Columbia

A mostly calm area not far west of Field.

Golden, British Columbia

North latitude, 51° 16′. West longitude, 116° 55′. Height above sea level, 2,583 feet.

Mean annual temperature, 38.3° (for eight years). Maximum mean, 40.2°, 1918. Minimum mean, 35.8°, 1911.

Mean annual range of temperature, 121° (eleven years). Maximum, 134°, 1909. Minimum, 109°, 1906.

Mean annual maximum temperature, 91.7° (thirteen years). Extreme maximum temperature, 99.0°, 1918.

Mean annual minimum temperature, 30.3° (eleven years). Extreme minimum temperature, 47.0°, January, 1909.

Mean annual rainfall, 10.01 inches (eight years). Maximum rainfall, 13.27 inches, 1910.

Mean annual days of rainfall, 39 (eight years). Maximum, 57 days, 1910. Minimum, 25 days, 1903.

Mean annual snowfall, 74.2 inches (nine years).

Mean annual number of days snowfall, 30 days (nine years). Maximum, 42 days. Minimum, 14 days.

Mean number of thunderstorms, 5. Maximum, 7 in 1903-6-11-14.

Mean number of fogs, 5. Maximum, 14, 1914.

Usually there is no frost in June and July, although, occasionally, there may be frost in June. August often passes without frost. Usually four winter months give below-zero temperatures, January, February, March and December. November occasionally makes the fifth month, while only two or three months may show below-zero temperatures.

Mean annual range of temperature, 23.3° (seven years).

Mean annual total precipitation, 19.61 inches.

Donald, British Columbia

North latitude, 51° 28′. West longitude, 117° 11′. Height above sea level, 2,579 feet.

Mean annual temperature, 38°.

Mean annual range, about 128°. Maximum range, 140° (1893).

Extreme minimum temperature, 45.0°. Extreme maximum, 97.0°.

In most respects similar to Golden, with the exception of much less wind, heavier snowfall and snow depth on the ground. Very little, if any, snowdrift. The observations were rather interruptedly kept for about seven years.

Glacier, British Columbia

North latitude, 51° 14′. West longitude, 117° 29′. Height above sea level, 4,094 feet.

Mean annual temperature, 35.4°. Maximum mean, 37.6°, 1915. Minimum mean, 33.2°.

Mean annual range, 102°. Maximum range, 112° (1909-11). Minimum range, 86°, 1915.

Mean annual maximum temperature, 83.8°. Maximum extreme temperature, 89° in January, 1918.

Mean annual minimum temperature, 18.5°. Extreme minimum temperature, 32.0°, 1909.

Mean annual rainfall, 21.01 inches (seven years). Maximum, 25.47 inches, 1915. Minimum, 13.24 inches, 1911.

Mean annual days of rainfall (seven years), 61 days. Maximum number of days rainfall, 76 days, 1915. Minimum number of days of rainfall, 44 days, 1909.

Mean annual snowfall, 432.8 inches (twelve years). Maximum, 557.3 inches, 1918. Minimum, 206.8 inches, 1905.

Mean annual number of days snowfall, 100 days. Maximum, 110 days, 1911. Minimum, 88 days, 1905.

Mean number of thunderstorms, 2.3. Maximum, 7, in 1908.

Fogs only occasional. July only very occasionally has frost. June and August more often with frost. Frost is very rarely recorded in September and the temperature in May, in some very few years, may not drop lower than 32°. Very seldom in more than four winter months does the temperature drop below zero, viz.: January, February, March, November or December. As an exception, it was below zero in October, 1905.

Mean annual daily range of temperature, 16.5°.

Temperatures do not rise nearly as high as at Revelstoke and they drop a little lower.

Maximum total precipitation, 74.64 inches, 1918.

Maximum monthly fall of rain, 8.64 inches, August, 1912.

Maximum monthly fall of snow, 142.3 inches, February, 1918.

Mean annual precipitation, 63.66 inches (eleven years).

At Bear Creek and Rogers Pass very heavy snow-slides occur in March.

REVELSTOKE, BRITISH COLUMBIA

North latitude, 51° 0′. West longitude, 118° 6′. Height above sea level, 1,746 feet.

Annual mean temperature, 43.9° (twelve years). Maximum mean, 44.8°, 1915. Minimum mean, 40.7, 1911, for eleven or twelve years.

Mean annual range of temperature, 103.8°. Maximum range, 119°, 1909. Minimum range, 92°, 1906-15.

Mean annual maximum temperature, 93.6°. Extreme maximum, 100°, July, 1908.

Mean annual minimum temperature, 11.6°. Extreme minimum, 30.0°, January, 1909.

Mean annual rainfall, 26.09 inches (eleven years).

Mean number of days rain, 103 days. Maximum, 120 days, 1908-14.

Mean annual snowfall, 151.9 inches. Maximum, 224.6 inches, 1918. Minimum, 99.3 inches, 1905.

Mean number of days of snow, 50. Maximum, 69 days, 1904. Minimum, 36 days, 1914-15.

Maximum monthly fall of snow, 78 inches, December, 1912.

Mean number of thunderstorms, 4. Maximum, 8, 1912. Minimum, 2, 1909.

Mean annual daily range of temperature, 19.6° (eleven years). Maximum, 22.9°, 1918. Minimum, 17.8°, 1905.

Usually no frost from June to August (inclusive), and in five years, June to September (inclusive). Only very occasionally the minimum temperature drops to 32° in June and occasionally there is no frost in May. Only very occasionally temperature does not go below zero for

the winter. Months with below-zero temperatures are: January, February, November and December. Usually only two or three winter months have below-zero temperatures, either January and February or January and December.

Temperatures of 90° or over sometimes occur in June and more regularly in July and a little less regularly in August, with occasional temperatures of 80° or over in September. May has a maximum temperature of 92°.

Mean annual precipitation, 46.18 inches in 1910.

The Chinook Wind

The Chinook winds are of fairly local origin and occur in Alberta, under the following distributions of air pressure; that is, when the barometer is high over the Rockies and a low barometer area is centred over Alberta or even Saskatchewan. Under these conditions the heavier air tends to move rapidly down the slopes of the Rockies towards the low centre, and, in doing so, it becomes dynamically heated as the air pressure increases with the lower levels.

It is also a very dry wind as well as abnormally heated, hence, the rapid licking up of the snow within its path. The Foehn wind of Switzerland is of similar nature. The origin of the name "Chinook" came from the Hudson Bay trappers of early days experiencing this wind first when passing the camp of the Chinook Indians, near Puget Sound.

The weather at the coast of British Columbia at the time of Chinooks may vary. Sometimes the barometer may be low, with rain, at other times a great high barometer area may extend from coast to the Rockies but, in all cases, the barometer is high over the Rockies and low to the eastward. The dry Chinook is a peculiar one. In the dead of winter it blows down from the mountains

and high plateaus, where ice and snow predominate, as a hot, dry wind upon the foothills and valleys below. The snow soon becomes moist and heavy under the influence of the blasts of hot air, and in an incredibly short time may entirely disappear. The arrival of the Chinook bears no relation to the shining of the sun, for it comes as frequently in the coldness of the night as in the warmth of midday.

Aside from its temperature, the Chinook bears an important relation to the amount of snow remaining on the ground in the mountains at the time of spring thaws. While in the more open valleys of the mountains its effect is noticed, it is from Anthracite to Kananaskis that it has special sway. In mountain-confined places in the Rockies, like Field, etc., a warmer air is experienced, but it is in the foothills and on the plains that the Chinook is fully developed. It is said, that the cattle on the plains in times of cold and hunger instinctively seem to anticipate its coming; for they stand knee deep in the snow with their heads turned toward the mountains, anxiously awaiting the arrival of relief.

In Banff, I have said, we have a suspicion of the Chinook wind fairly often. In a winter one can see snow and ice disappear where the wind has full sweep. It does not disappear so quickly as elsewhere and the temperature does not change so rapidly, but here we also have occasional well defined Chinooks in a period of years.

The wet Chinook is rare, but we have had at least one or more of these in a period of years. In one specially marked one the temperature did rise somewhat suddenly with a warm wind, accompanied by a rather heavy, warm rain. Chinooks may last for a few hours, a day, or up to three days. The Chinook may occur in summer as a dry warm wind, but it is much less common than in winter.

The velocity of the Chinook depends, apparently, in a large measure on the steepness of the barometric gradient existing between the neighbouring areas of high and low pressure. If the gradient is steep the Chinook comes with a rush and the roar of a gale velocity. At other times the advent of the Chinook is less violent but eventually the wind increases in force.

The prairie people can see the coming of a Chinook by the colour of the sky over the mountains in the west, while at Banff we see this dark Chinook band in the east an indication of the coming of the Chinook effect in the mountain valleys. Another indication that the writer has noticed at Banff is that on one of the ridges of Cascade Mt. (a mountain facing the town—altitude 9,800 feet), at an altitude of 7,100 feet, when the ridge holds no snow, as is often the case, the rock becomes a dark grey, evidently from the warm dry wind striking the cold rock and producing moisture. This occurs, at least, some hours before any change in the temperature is experienced in the valley and is an almost infallible sign of a coming change. It is then likely to be blowing a Chinook farther east towards Kananaskis.

The Chinook wind in passing over the mountains has an effect and some evaporation of snow takes place. On the western slopes, about Banff, the snow surface becomes glassy ice, rock partly exposed from under snow will become wet, while the snow along the top of a mountain is softer but does not wet one's snowshoes, which would be the case if there were a thaw. All slopes facing west and more or less free from timber must be affected to some extent, some very much so, but the temperature does not rise very high; in fact, the wind to the feeling is by no means warm. Observation does not show that a change to higher temperature on the Alberta prairies is indicated much in advance by a change occurring on Sulphur Mountain; while, on the other

hand, cold waves setting in from the north are usually well marked on the plains before any change occurs at high levels.

The writer would like to give one such very marked example. While on Sulphur Mountain, January 29th, 1920, Calgary got a very sudden drop in temperature. In due course this reached Banff, the temperature dropping very suddenly from 39° at 7.45 a.m. to about 8° above zero by 10 a.m. On the mountain at 7.45 a.m. it was 28° and rising, so that when the writer left at 2 p.m. it was 30° and was nice and mild till about 800 feet above the town, when the sudden change to cold greatly surprised him. It was then about zero and was the more felt on account of the different quarter the wind was in. This sudden change never reached the Sulphur Mountain Station, and likely did not rise much over 1,000 feet above the valley. Other records show even more marked differences than this, in some particulars. I will refer to one of these elsewhere.

Winds on the Mountains

Designation of gales	Miles per hour
Moderate gale	31 to 38
Fresh gale	39 to 46
Strong gale	47 to 54
Whole gale	55 to 63
Storm	64 to 75
Hurricane	above 75

About seven years' records of winds have been obtained from the anemometer on Sulphur Mountain. Occasional breaks in records after severe gales have occurred on account of the contact getting out of order between visits to the building, but much useful and interesting information has been received. The year 1905 will be taken as an example of general winds. The prevailing wind is southwest.


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BANFF OBSERVATORY ON SULPHUR MT. AT 7455 FT.
Looking Northwest

The number of gales in 1905 was 145. The maximum force was 73 miles per hour. Only about four of these gales were from a northerly direction.

NUMBER OF GALES PER MONTH

January	7
February	18
March	14
April	9
May	4
June	4
July	6
August	16
September	14
October	15
November	22
December	16

Other years give a greater or less number of gales and in some instances heavier gales.

Gales are far more numerous in the winter months. November has, as a rule, the greatest number and the most severe. A record of one gale shows several hours over 60 miles, several hours over 70 miles and up to as high as about 100 miles per hour. On October 2nd, 1917, while on a regular trip to the mountain station, a whole gale was blowing along the top of the mountain. This increased, it is believed, to something over 100 miles per hour during the night. The writer's calculations were made on the wind's effects, for it blew down and uprooted many more trees than ever before and snapped off the stems of many others on the mountains. While it was of much interest to have experienced what a wind of this force was like (for a night is spent in the building on each of the writer's visits, and one would have been almost forced to stay overnight during this wind, anyway), still, at the time, it was rather alarming for the

strong stone building could be felt to sway. One was afraid the heavy anemometer would be blown from its pedestal on to and through the roof. The vibration caused much noise, the strong roof creaked and the supporting beams cracked. The wind could be heard coming in exceptional booming and hissing gusts in the distance and one wondered if the building would outlive each particularly strong gust. A drop in the wind for a few seconds would be something like the back jar one feels when a train applies the steam brakes, but on a much smaller scale. Some terrific gusts and the whole building would seem to tremble. The electric lights in town kept going out and in as the wires were short-circuited. There was the Chinook band across the northeast horizon. The coal fire in the stove burnt so fiercely and emitted so many sparks that it had to be extinguished. Clouds were moving very fast from the southwest (the direction the wind was from). All night it blew, increasing in force and becoming exceptionally strong between 6 a.m. and 8 a.m. of the 3rd, but decreased somewhat between 9 a.m. and 11 a.m. Rain fell at 9.15 a.m. and it became misty. Fresh snow on the mountains was going quickly during this time. In the morning an exceptionally fine, very bright and clear rainbow was seen of roughly 12,000 feet centre height and 4,500 feet base tips. Optically of seven miles diameter it appeared again and again for four hours, bathing the mountains in all its colours, the wind causing it to spread out at times. The force of the wind in our valley at this time, although uprooting trees, was of much less force than on the mountains where there are no obstructions.

Northerly and easterly winds never reach the force of westerly winds. This is true of our section of the mountains and I presume it is practically the same for all our mountains. The record of a northerly wind of 45 miles per hour seems to be a maximum, and this appears

to be quite rare. These north or northeasterly gales more often do not exceed 30 to 35 miles an hour and do not last very long—only a few hours at most. In fact, north or northeasterly winds are very often quite light winds. Of all the gales that pass over the mountains, comparatively few seem to reach the mountain valleys, and those that do have not the force they gather on their way high up. However, personally, the writer has not had time to follow this matter up with satisfaction to himself.

For more than a month at a certain season the maximum force of gales has occurred, almost regularly, at nearly stated hours — between 4 p.m. and 5 p.m. (mountain time)—but a maximum occurs more probably at a certain number of hours after a gale has started. The winds more often seem to be stronger during the night than during the day; at least, during certain seasons.

On the summits of some of the passes in the mountains the winds appear to be most frequently nocturnal. This was noticeable on Simpson Pass, eighteen miles from Banff, where very little wind was noticed during the day all summer but nearly every night the wind would blow strongly through the plateau or mountain valley.

Temperatures on the Mountains

While temperatures on the mountains are generally lower, both summer and winter, than in the valleys, and the range of temperature less, still there are times when inverse temperatures occur.

During very low temperatures on the prairie and in the mountain valleys, the readings on Sulphur Mountain, at the same time, show that it is often many degrees milder up there. One practically experienced change of this sort which occurred some years ago. A particularly

cold wave set in from the northeast with a nasty, biting wind although the temperature was not lower than 35 degrees below zero. It is a question if it has ever felt colder even when the glass once showed 59.5 degrees below zero. One expected that the trip up the mountain would be simply awful. On arrival at the hot springs, 800 feet above the town, conditions had not bettered but seemed to be worse if anything. On starting up the mountain trail one felt that a fan was not necessary, but a gradual change was taking place in the temperature, from, perhaps, not more than 100 to 200 feet above the springs. Above the hot springs the slope is wooded, but not densely so. The change went on gradually, but it was not until the top was reached that the full effect of a much higher temperature was felt, for along the top the wind was from the southwest and very light, and the temperature 4 degrees above zero in the shade. In comparison to the valley it was like summer. If the difference of temperature were taken from that of the valley it would be about 34 degrees, or a little more, for I think the glass had gone up a few degrees before the trail was struck. On arrival back just above the hot springs it felt more like the South Pole than anything else.

January, 1916, gave a mean temperature of 13.1 degrees below zero for our valley. This was lower than any previous record for any month for over thirty years. The long continued cold covered all the west, the north being most excessively cold. About one-half of the way across Lake Superior and all over eastern Canada the temperatures were exceptionally high, with rain. The records from Sulphur Mountain were very unfortunately disconnected in places, but enough information was had to show that the temperature mean was much higher than in the valley; only towards the latter part of this very cold month did the temperatures come nearer the

valley readings and even then they were eight or more degrees higher.

In a two weeks' record for this particular time there was a difference of about 45 degrees between the maximum temperature in the valley and on the mountain, in favour of the mountain. The temperatures did not drop to 30 degrees below zero in the one cold dip of these two weeks, although, in the valley, temperatures of from 35 to 45 degrees below zero were occurring almost daily.

The limit of this long continued cold was at about 6,500 feet of altitude. Possibly at 10,000 feet the temperatures did not go even as low as 7,500 feet of altitude. Cumulus clouds for some days were moving from the west or southwest. The altitude of the cold limit varied at times, perhaps at first being as low as 5,500 feet of altitude and very occasionally up to 8,000 feet or so.

The writer regrets very much that he did not put in the month at the building on Sulphur Mountain in order to study the conditions. Of course such long continued cold weather was not anticipated and other work was dividing his attention. Food supplies were not sufficient and to get up enough supplies might have been difficult. However, the matter was not considered until this interesting month had gone. The real point is that it was not prepared for.

Sometimes, during very ordinary zero, or a little below, temperatures in the valley the mountain readings are a few degrees to a number of degrees higher. In summer, when the mountains have longer sunlight—one hour a.m. and one hour p.m. on Sulphur Mountain and on other mountains, more or less according to position and height—the temperatures are sometimes ten degrees higher at or about sunrise than in the valley.

Seventy-six degrees in the shade is the highest temperature recorded for our mountain station, the minimum being practically the same as the valley, 47 or 48 degrees below zero. Occasional sudden and short-lived northern cold storms reach the top of the mountain about the same time as in the valley.

The mountain thermograph is an exceptionally good instrument, for it seldom varies as much as a degree at above zero temperatures, while, at below zero temperatures, its tendency is to only read from one to two degrees too low, according to whether the temperature is a few degrees below or many degrees below zero, and it is always checked by three standard spirit thermometers, viz.: ordinary thermometer, and maximum and minimum self-registering thermometers.

The original barograph was broken to splinters by lightning. The one in use at present, after some time spent in having some adjusting and regulating done, is practically perfect for, when it is checked by a mercurial barometer in the building, it has been found to be to all intents and purposes always so nearly correct that the difference is of no consequence. For instance, lately the difference has been only two or three thousandths of an inch.

Snow Survey

A snow survey has been carried on for the last four years, in the vicinity of Lake Louise, for three or four days from May 31st in the same location each year.

The snow is taken as to depth and weight in an area at each location and averaged. This survey gives a very good understanding as to what the conditions of the storms will be during the high water period. A specially constructed tube is used and scales carried to get the weight.

It is possible to have a very good understanding how the snow is lying on the mountains, as to locations of drifts, etc., from the weather records kept at Banff and, from the conditions on Sulphur Mountain, one can pretty nearly know what it will be like on all other mountains. The greater or less departure from regular routes of snowslides has been clearly arrived at by the records of winter weather at Banff.

It is interesting to watch the winds work in building up snow cornices on Sulphur Mountain (as an example). The westerly wind blow the loose and unpacked snow on the usual overhanging cornices, but, as these winds flow over the top, they often act like a bird flying before the wind, which wishes to light, for the wind then whirls or circles back to the west and, with an up curve, builds the snow under the cornice. This goes on all winter after fresh snow. A stormy northeast wind forms gap-like depressions in the cornice and, with the snow that may be falling and loose snow, form drifts on the top of the mountains only to be driven back again by the next southwest wind, providing these drifts have not become too hard or have packed.

Conclusion

If in any way the writer has contributed some better knowledge of the climate of the Main Range and the Selkirks this small effort will not have been in vain. On some points there may be a difference of opinion and, as to the mountain work carried on in this connection, it is hoped that he has not made it appear in any way exaggerated, or that any of the undertakings have been anything out of the ordinary, for every mountaineer knows well that for snow to blow is quite natural, but for a human being to do so is very bad form.

MOTION OF THE YOHO GLACIER

1917, 1918 and 1919

By Arthur O. Wheeler

The Yoho Glacier was visited on the 30th July, 1918, in order to make the annual measurements and ascertain the rate of flow and advance or retreat of the ice forefoot for the previous twelve months.

On July 31st, 1917, five metal plates had been set across the forefoot on the usual line. Of these only four could be found, No. 1 having been lost through melting of the ice or by deposit of morainal detritus where it had been set.

Rate of Flow

The following table shows the movement of the plates set across the forefoot for the full year, less one day.

Table showing the motion of plates set on the Yoho Glacier between 31st July, 1917, and 30th July, 1918—364 days

Plate	No. 1	No. 2	No. 3	No. 4	No. 5
Total motion...	Plate lost	109 ft.	115 ft.	107.5 ft.	75 ft.
Average daily motion......	Plate lost	3.59 in.	3.79 in.	3.54 in.	2.47 in.

Mean Average Daily Motion—3.35 inches

For Advance or Retreat

The usual measurements were made from the marked rocks, Nos. 1 and 2 on the left side of the stream and from the Sherzer Rock on the right side of the stream. A table of results follows.

Table showing Measurements to Nearest Ice

Year	From Rock No. 1 left side of stream	From Rock No. 2 left side of stream	From Sherzer Rock right side of stream
1917	454.5 ft.	483.5 ft.	250.0 ft.
1918	474.6 ft.	503.0 ft.	353.6 ft. To nearest solid ice.
1919	.....	.....	446.7 ft.

1917-1918, Average Retreat of Ice Forefoot—47.7 ft.

Annual Change in Formation of Ice Forefoot

The change in 1918 was very marked. It was found impossible to cross the Canyon of Waves Creek, which had heretofore been bridged by the ice, without making a detour of several miles and, in consequence, the torrent flowing from the snout of the glacier (Yoho River) had to be crossed on horesback, a very dangerous proceeding, but one that was accomplished without accident.

The recession of the ice on the left (east) side was most remarkable. Here, great cliffs of bare rock were uncovered and a foaming waterfall thundered over the sky-line of the cliffs, sending its torrent to swell the volume of Waves Creek.

1919

On August 1st, 1919, it was found impossible to cross the Yoho River, even with horses. The canyon of Waves Creek was now quite clear of the ice which had retreated a considerable distance from it on the west side. The canyon was followed for some distance on the north side, which could be reached from the ice, but no possible crossing could be found and progress was soon cut off by a second canyon joining that of Waves Creek at right angles and containing the torrent from the falls previously referred to. In consequence, measurements from Rocks Nos. 1 and 2 could not be made.

Three of the four plates set out in 1918 were found on the ice forefoot, but their position could not be ascertained as it was not possible to reach the measuring base on the old lateral moraine on the east side of the forefoot. Moreover, the forefoot had become so greatly crevassed and foreshortened as to render further setting out of the plates impracticable. It was therefore decided to discontinue the annual observations which had been carried on since 1906.

Summary of Results

Mean Average Daily Motion of Plates set on the Yoho Glacier

1906-1907	3.15 inches
1907-1908	3.12 inches
1908-1909	3.23 inches
1909-1910	3.11 inches
1910-1912	3.09 inches
1912-1913	3.74 inches
1913-1914	5.03 inches
1914-1916	Plates lost; no record
1916-1917	3.10 inches
1917-1918	3.35 inches

Omitting the years 1914-1916 when the plates were lost, the records show a mean average movement of the surface of the ice forefoot of 3.40 inches per day for a period of ten years.

The mean average daily movement of 1913-1914 of 5.03 inches is abnormal by comparison with other years. No reason is known for such increase as the recession of the ice forefoot was practically normal.

Omitting the year 1913-1914 the mean average daily movement for the surface of the ice forefoot was 3.22 inches per day for a period of nine years.

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Photo, A. O. Wheeler

ICE FOREFOOT OF YOHO GLACIER FROM STATION E, 1919

Note Canyon of Waves Creek below Icefall, now clear of the Ice which formerly bridged it. (See p. 76, 1918 Issue of Journal)

Photo A. O. Wheeler

LOOKING DOWN YOHO RIVER VALLEY

From Icefall of Yoho Glacier

Measurements for Advance or Retreat

Since 1906, the year in which the measurements were initiated, the results show that the forefoot of the glacier has been steadily retreating. They are as follows:—

1906-1907—Average retreat of ice forefoot	19.6 ft.
1907-1908—Average retreat of ice forefoot	37.5 ft.
1908-1909—Average retreat of ice forefoot	39.0 ft.
1909-1910—Average retreat of ice forefoot	46.5 ft.
1910-1912—Average retreat of ice forefoot	49.3 ft.
1912-1914—Average retreat of ice forefoot	31.1 ft.
1914-1916—Average retreat of ice forefoot	98.6 ft.
1916-1917—Average retreat of ice forefoot	26.3 ft.
1917-1918—Average retreat of ice forefoot	47.7 ft.
Total average retreat in 12 years	395.6 ft.

Reference to the map of the ice forefoot shown opposite page 274 of the 1908 issue of the Canadian Alpine Journal will enable the method of the measurements of the flow to be understood. It also shows the position of Rocks Nos. 1 and 2 on the east side and of the Sherzer Rock on the west side from which the measurements for advance or retreat were made.

A good idea of the general shrinkage may also be obtained by noting that the rock canyon of Waves Creek, which comes in from the northeast on the east side of the ice, disappears under the ice about the middle of the forefoot. Its torrent reappears at the end of the extreme snout in the Yoho River. This was in 1907. In 1919 the entire canyon and its torrent were found to be clear of the ice, which lay to the west of it.

MISCELLANEOUS SECTION

THE STORY OF A FAILURE

By Val. A. Fynn

On August 21st Rudolph and I made an abortive attempt to climb the east face of the main peak of Mt. Victoria. Leaving the hotel at 2.30 a.m. we reached the breakfast place near the upper Victoria Glacier at 5.30 and the foot of the face at about 9 a.m. The weather was fine, but there was a very strong wind from the northwest and we were balked by falling stones. This was due partly to the strong wind and partly to the very small amount of snow.

A few days later Mrs. Fynn and I spent a most enjoyable day at Rudolph's home in Golden and, meeting a Brewster representative on the train, I arranged to start on a hunting trip on August 31st, my intention being to hunt moose in British Columbia. A couple of days before the time set for the departure, and after all the licenses for British Columbia had been secured, my attention was called to the fact that moose would be closed in the district into which we proposed to go. I then decided to go after sheep and, because my time was limited, determined to try my luck in the Clearwater district. This meant Alberta licenses.

On August 31st Rudolph and I set out with Bert McCorkell and Chancy Fitten, known as "Reno," Bert acting as guide and cook and Reno as horse wrangler. We all stopped at the game warden's cabin down by the railway station and had our rifles sealed, then proceeded

into Pipestone Valley in pouring rain. Some five hours later we stopped at the game warden's cabin (fourteen miles) in Pipestone Creek. This cabin enabled us to spend a very comfortable night, in spite of the continued rain. Late in the afternoon, Jack Michigo arrived with his party, and was, of course, much disappointed to find us in possession. Unfortunately, the cabin was not large enough to accommodate both parties. Jack was piloting three Americans who intended to shoot sheep in the Brazeau country.

Next morning, September 1st, was the opening of the season, but we were still in the Rocky Mountains Park. The weather seemed to be on the mend, and we made an early start for Pipestone Pass (8,364 feet), which lies at the head of Pipestone River (twelve miles). On the pass we had to fight a snow storm and a bitterly cold wind, but finally got over and began the descent. Here I inquired as to the pass leading into Clearwater, but was told that all we need do was to follow the valley in which we now were. The further we travelled, the better the weather became, and we finally found a lovely camping ground some eight miles north of the pass at the foot of a beautiful and evidently still unclimbed peak which stands between the Siffleur and the Dolomite Valleys. Immediately at the foot of the mountain are a couple of fairly large lakes.

I was carrying a model 95 Winchester rifle bored for the British army cartridge (.303), but had never fired a single shot from this weapon. It was fitted with the military, as well as the Lyman sight. Of course, I should never have started out without testing this rifle, but I did so, and nothing remained but to fire a few sighting shots now. We were well out of the park and I proceeded to do so, discovering that I could not use the military rear sight, this not being sighted below three hundred yards and that the front sight was too low for

the Lyman rear sight. At one hundred yards the combination shot about one foot high. This discovery was not pleasant, but there was no way out of it and it was all my fault, so I removed the military rear sight and hoped for the best.

In the evening Bert informed me that we were in the Siffleur Valley and off our trail and that soon after crossing Pipestone Pass we should have turned east and gone over another pass into Clearwater. Under the circumstances, it seemed best to first try our luck in this neighborhood. We spent all of the morning and part of the afternoon of the next day in a fruitless tramp up and down the gulleys on the east side of the valley. We saw a number of sheep tracks, some of which were quite fresh, but all were moving down the valley and there were no signs of the animals themselves. At about noon we spotted three men on a ridge some way up the valley and came to the conclusion that they belonged to Jack's party, which we knew would be following us. On our return to camp, Reno, who had been left behind, asked with a broad grin whether we had had any luck, and then informed us that Michigo's party had made camp some three miles nearer Pipestone Pass and had spent the morning firing at a target which they had placed high up on one of the ridges on the eastern side of the valley. It appears that they fired some sixty shots right where game might be expected and had, of course, frightened everything away.

On September 3rd we broke camp early, retraced our steps to the neighborhood of Pipestone Pass and crossed over into the Clearwater, making camp near the shores of the first large lake (thirteen miles). The park boundary runs through the bottom of this valley, and hunting is permitted on the north side only. On September 4th, Rudolph and I spent all day up in the hills without seeing a thing or a track. The weather

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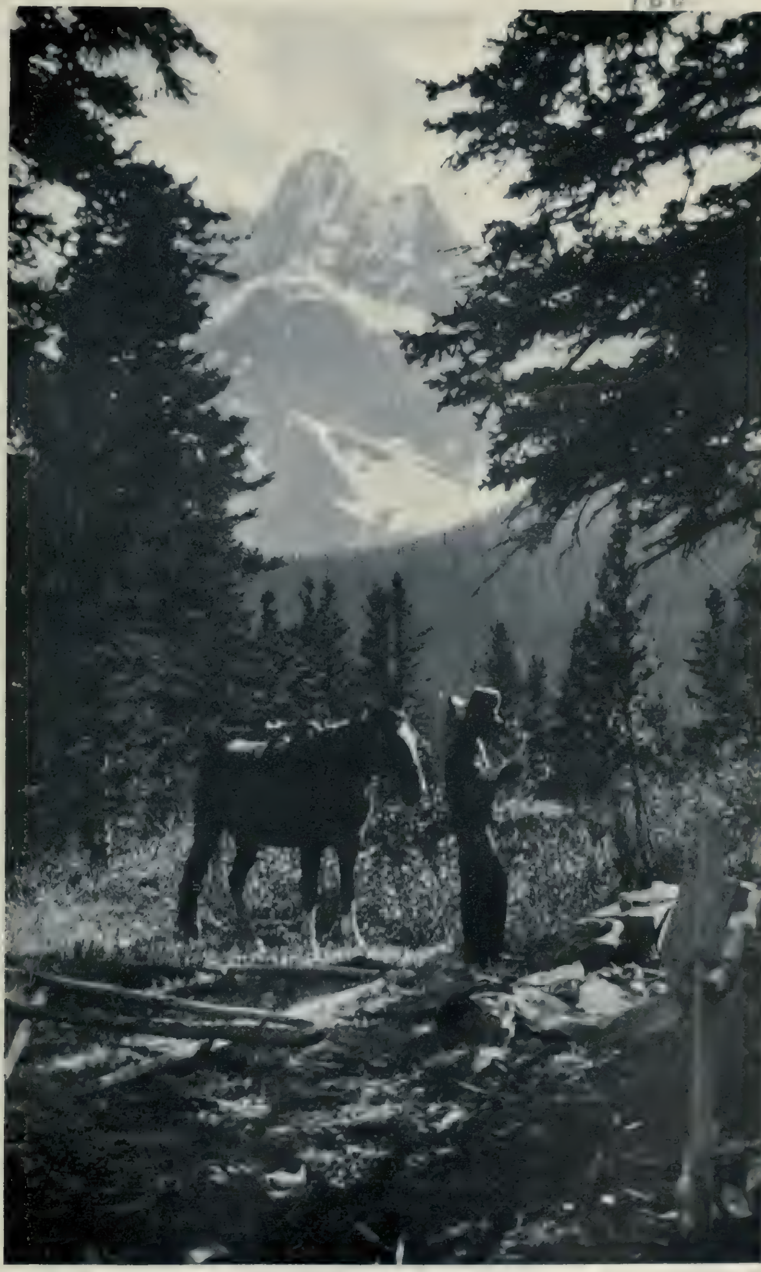

Photo, Val. A. Fynn

CAMP IN SIFFLEUR VALLEY

Unnamed Peak (9500 Ft.) from North between Dolomite and Siffleur Creeks

had, fortunately, improved considerably and we decided to move on. In the evening, Rob Baptie and Soapy Smith came along from the east and made camp in our neighborhood. A couple of days ago this party had killed two sheep, and very kindly presented us with a hind-quarter, which proved a most welcome and needed addition to our larder. It rained during the night and the next day was somewhat threatening, but we moved some seven miles down the valley and pitched our camp in a spot which had evidently been patronized by the Indians in years gone by. We found three or four Indian "Turkish baths." In order to make such a bath, the Indians build a dome out of willow branches, from which all leaves have been removed, cover it with a number of blankets, place red-hot stones under this cover, creep in and pour water over the stones; the steam thus produced gives the effect of a Turkish bath.

Neither Rudolph nor myself had ever hunted sheep. We both knew something of our chamois and Rudolph had hunted mountain goat. Upon inquiry, we were told that sheep were white and should be looked for in the timber or at timberline. Having reached our camp soon after noon, we consumed a hasty lunch and started out with our rifles. We immediately came across deer tracks and one of these animals darted by as we were struggling up a dense wood, but we had no chance to shoot because of the numerous trees. Towards evening, Rudolph disturbed some kind of an animal which he could not identify because of the dense growth and we got back to camp feeling certain that game of some sort was to be had in this neighborhood.

The next day Rudolph and I again set out, striking in a different direction and following what we believed to be an old Indian hunting trail. We saw many game trails, most of them were quite old, but fresh tracks

were also met with here and there. Towards noon we were on a ridge on timberline and had just swept the neighborhood with our glasses without discovering any game, when, looking about idly, I saw something dark moving high up near some screes. When I first looked at the object with my glass it appeared like a pony which had strayed, but closer examination disclosed the fact that it was a very large sheep. Contrary to our expectation, the animal was dark red brown with a white mirror. It was grazing on a little patch of grass at the foot of a long scree slope, just at the head of the valley. The wind was blowing down the mountain and the ridge on which we stood ran so far above the scree slope that an approach from that side seemed impossible.

It was finally decided that Rudolph should guard the ridge and that I should attempt a stalk from below. We, of course, knew that such a procedure is quite unsatisfactory, and generally undesirable, but this appeared to be the only thing to do, particularly as we expected our proposed prey to turn to what we imagined were its usual haunts, namely, the ridges and gullies below tree line. I naturally lost sight of the sheep very soon after my start and when I arrived on the spot which I was approaching, the game had disappeared and I could find no trace of it, nor could I see Rudolph. Later, I learnt that Rudolph had proceeded along the ridge, had come across fresh tracks in the snow and, following these, found that the animal we had seen, together with some others, had climbed the long scree slope, some snow slopes above the same and had crossed a high snow and ice pass near the summit of a peak of nearly ten thousand feet in height. This convinced us that the information we were working on was wrong, and we decided in the future to treat sheep as chamois.

The whole party left camp early the next morning in cold and damp weather, with the idea of riding as close

as possible to the peak on which we had located the sheep. We finally succeeded in reaching its foot and, leaving our horses, climbed to a ridge which would give us a view of the spot on which we had seen the sheep on the previous day. Nothing was in sight, so we crossed to another ridge which allowed us to overlook the back of the peak. We soon discovered yesterday's tracks and presently located five sheep about one mile off on a ridge parallel to ours. The top of the peak could not be seen because of low clouds and the visibility in general was very poor. We had occasional flurries of snow, and as there was no chance at all to approach the sheep we had located before night fall, we decided to go back to camp, work out a plan of campaign and return to the spot the next day.

The whole party set out very early on September 8th. Rob and Reno rode around the far ridge, Rudolph went up the valley between the two and I started to climb the ridge from which we had seen the five sheep and was then to take up a position on their line of retreat over the high pass which some of them had crossed a couple of days ago. In order to reach my position, I had to cross some steep slopes partly covered with ice, in full view of the opposite ridge. Before attempting this, I thought it better to locate the sheep, and I finally discovered fifteen of them a little above the spot at which we had seen them on the previous day. Just as I began my traverse, Reno appeared on the sky line and walked up the ridge without any attempt at concealment. The sheep immediately saw him and started up the slopes.

It appeared to me, then, that the carefully laid plan was entirely upset. The sheep were making in the direction of a col guarded by Bert, he would turn them back and they would be over the col I was supposed to be guarding long before I could get to my assigned position, for I had nothing but my rifle. The going was not

quite easy and the distance to be covered was considerable. It was quite impossible for me to keep my eyes on the sheep and keep moving at the same time. I lost sight of them immediately. Presently I heard three shots, but could see nothing except that the sheep had evidently not turned in my direction, for I could overlook the snow slopes which they should have followed, had they come towards me. I was then near my allotted position, stopped and carefully examined the scene with my glasses without, however, being able to discover anything of the sheep. I could see Reno on the ridge and he was presently joined by Rudolph, but I could see nothing of Bert. This led me to suppose that the sheep had gone past Bert, that he had probably shot one or two, and was now picking them up. It occurred to me that some of them might circle back to the position in which Rudolph and I had first seen them. I, therefore, went back to my ridge and traversed around the peak to a position from which I could overlook that spot. There I waited for a couple of hours and, seeing nothing, went down to where I had left my horse and rode back to camp.

Very late that evening the rest of the party arrived. all looking very gloomy. After explanations had been exchanged, we found that Bert had succeeded in turning the sheep, but that they had not taken to the route which some of them had followed on the previous occasion, probably because they had seen me approaching this route, but had taken to a nearly level ledge running parallel to this route, but high above it, near the summit of the peak. This ledge ends on the pass which the animals had crossed a couple of days before. At the time I was looking about, wondering what had happened, the fifteen of them were standing or lying on that ledge just above me, but I could not see them because I was too close to the steep walls below it. The animals could not go further in the direction of the pass because of an

extremely steep ice slope which they evidently feared to tackle and they did not go back because they could see Reno and Rudolph who had gradually approached the beginning of their ledge.

When my companions saw me retracing my steps and circling around the mountain, they concluded I had seen the sheep and was going to climb to the pass near the summit of the peak, for I was actually following the route which I should have followed had this been my intention. Had I done so, we would have had the fifteen sheep at our mercy, cornered on the high ledge with me at one end and my three friends at the other. They waited around until 6 p.m, and, of course, saw nothing of me, for by that time I was well on my way back to camp. Rudolph tried to get on the ledge and follow the sheep, but could not quite manage it. He then tried to get to the main ridge of the peak above the ledge, but was again foiled. By the time my companions realized that I had not seen the sheep, it was too late for Rudolph to cross the intervening valley and climb to the pass, on which I should have stood, so they all came back to camp. On the way home Bert killed two grouse, shooting the head off one with his revolver and the head off another with his rifle.

On September 9th we took a much needed rest and carefully considered our next move. Our provisions were about exhausted and we had nothing to show for our strenuous and sustained efforts. It was decided that, with a little care, we could last until the 13th, so we planned another day after our herd of fifteen and then a dash for home. Early on September 10th the whole outfit started out for the scene of our defeat, this time making better arrangements for timing the movements of the several members of the party and also agreeing upon signals. Everything worked very well in the most beautiful of weather, but there was not one sheep to be

seen. This time I went straight to the pass which the sheep crossed on the first day we saw them, and later was joined by Rudolph. We signalled Bert and Reno back to camp and followed the tracks of the sheep over the pass which had been held by Bert. We traversed along the head of the next valley and as we were approaching the next ridge five sheep suddenly came into view some six hundred yards ahead of us. We could see with our glasses that there were no good heads among them.

The distance appeared rather great for a safe shot and we had an inkling that the rest of the herd would probably be found just the other side of the ridge, so we let these five go, admiring the elegant and effective manner in which they negotiated the not altogether easy rocks of the ridge, following same in the direction of the summit of the peak. Upon reaching the ridge we could see no signs of more sheep and were about to follow the five we had just seen, when, very far down the valley, beyond the ridge on which we stood, I thought a saw a lone and very large specimen, grazing near treeline. It was then six o'clock, the sun was going down and the shadow of some of the surrounding peaks was just about to reach the animal. After a good look, Rudolph confirmed my view and gave it as his opinion that we were looking at a very fine head. Accordingly, we decided to go after it and not disturb the five young ones behind us. I undertook to stalk the lonely one. To this end I had to make a considerable détour in order to keep out of sight behind the ridge and Rudolph was to remain on the ridge, because we felt sure that if I missed my animal he would make for this spot. I immediately started down, going as fast as I have ever gone in the mountains, yet it took me a full hour to get within striking distance. I crossed the ridge at exactly the right point and began my stalking, going down to the spot where I had last seen the sheep. After about half

an hour's anxious work I approached a large and somewhat weird-looking tree stump, but saw no sign of a sheep. On looking up, I perceived Rudolph on his way down, and concluded that he had seen the animal move away. When he joined me he admitted that he had been watching our big head for half an hour, and, not seeing it move at all, had come to the conclusion that he was watching an inanimate object. As a matter of fact, I had been stalking the queer looking tree stump. To say that we were disgusted is to put it mildly.

We were now in a valley in which we had never been before, but from which we thought we could reach a creek which would take us straight back to camp. It was eight o'clock and speed was evidently imperative. For an hour we trudged up the valley and then found that we had the choice of two passes, each about nine thousand feet high which might or might not lead us to the desired creek. Under the circumstances, we preferred to turn back and make for the White Rabbit Trail, which we knew. In the dark we reascended some of the slopes down which I had raced with such high hopes not so long ago, and finally, just after midnight, struck the trail fifteen miles from camp. We followed this for five or six miles and then I struck. I was dead tired and refused to go any further, so we stepped into the undergrowth, collected firewood, made a large fire, and, using the green undergrowth as a protection against the wind, managed to get a few hours of fairly comfortable rest.

The next morning we reached our camp at about eight a.m. to the great relief of our friends. After a hearty meal we packed up and rode up the valley on our way to Lake Louise, making camp that night at about six p.m., some twelve miles west. While the packers were unloading the horses among the trees, Rudolph stepped out into the open and searched the ridges above us for game. Within a few minutes he shouted for me

to put on my climbing boots and get ready to start for he had just discovered three goats. I did as requested, and then joined him. The goats were indeed there, but very high up, and we could not figure out any way of approaching them successfully.

As we were studying the proposition, a fourth goat appeared a little lower down the ridge and effectively blocked the only line of approach which we could pick out. We thought the only thing to do would be to try and approach them the next morning before sunrise, but the fourth goat was moving about a good deal and presently started down. It would descend a few yards, look around leisurely and then go a little lower. We decided that it was coming down to feed and this proved to be the case. This goat actually came within an easy half hour of camp, so we started to stalk it. We had to approach it from below, but there was a strong wind blowing down the mountain and we felt pretty sure of success. Of course, as always happens when one tries to approach from below, the game is lost sight of and is able to change its position without the hunter becoming aware of the change. This happened to us, and by the time we reached the spot where we had last seen our goat and were forced to show ourselves, it had moved on and stood about 450 yards away. Rudolph urged me to shoot immediately, but I had little confidence in my ability to hit the mark at that distance because of the difficulty with my sights.

After using his glass, Rudolph found that the goat was looking straight at us, and this, of course, meant that it would presently move away. I was forced to shoot or lose every chance, for Rudolph's short carbine would not carry the distance with sufficient accuracy. By the time I got ready the goat had turned around and was walking away. I shot, but the goat continued to walk as if nothing had happened, from which we

Photo, Val. A. Fynn

A ROCKY MOUNTAIN GOAT HUNT

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concluded that it had been hit, for it would otherwise have immediately bolted up the mountain, so we raced after the animal and, having gained a few yards, threw ourselves down and shot at it again, apparently without effect. This performance we repeated two or three times, probably shooting worse and worse. Finally, the goat stopped and turned around, thus offering a better target. I took careful aim and the animal collapsed, but it recovered and went on, we following as before, Rudolph a little above the goat's line and myself a little below same. I was presently stopped by a considerable drop which the configuration of the ground had prevented me from seeing. Fortunately this did not reach very far up, and did not trouble Rudolph.

Just about that time the goat was on the skyline and about to pass out of sight. Perspiration had long ago blurred my spectacles. I heard Rudolph shoot and thought I ought to do the same. Quickly getting into position I saw an outstanding object against the skyline and shot at it, being rewarded by a shower of splinters from the large rock which I had successfully hit. As Rudolph crossed the skyline he found the goat within a short distance, and evidently in distress; he was able to finish it with a shot through the shoulder. It fell down a ledge or two, and when we came up with it we found that it was a very large animal indeed, about six feet long, weighing about 225 pounds and probably nine or ten years old. It was too late to do more to it than was necessary before returning to camp. The next morning we took a pack horse up as far as possible, skinned the animal, cut it up and brought the meat and the head down to the pack horse.

That day we made the game warden's cabin in Pipestone Valley (seventeen miles) and again ran into the worst of weather on the two high passes which we had

to cross. On September 13th we covered the last fourteen miles to Lake Louise at racing speed. The horses knew that they were going home and, with a square meal at the end of the journey, we had no intention whatsoever of curbing their enthusiasm.

From what I have seen of sheep, it is quite clear that they should be hunted like chamois. Their ability to negotiate difficult rocks is truly remarkable and they are also perfectly at home on easy ice and steep snow. The conflicting information one receives about their habitat no doubt arises from the fact that they adapt themselves to circumstances. Where there is very little or no hunting they will often be found below tree line, but where they are fairly regularly hunted, they will always keep high up, selecting open and commanding positions difficult to approach. There are white sheep, but these are found in the North only. In the districts around the Canadian Pacific Railway sheep are grey or red brown, according to season. It seems to me that sheep are far more intelligent than goats and more difficult to hunt. Sheep meat is delicious, but good heads are rare in the more easily accessible districts.

It is a bad plan to camp anywhere near the hunting ground. Camp noises, such as chopping wood, horses' bells, human voices, are heard on all the surrounding ridges and disturb the game. In September the weather is likely to turn cold at any time, and it is very necessary to carry warm clothing, for slow riding at low temperatures, and with a high wind is no joke. It may smack of the "woolly west," but wool chaps are the only things that will keep one's legs warm; a mackinaw jacket and a raincoat will nicely take care of the upper body. Long woollen gloves are almost indispensable. An air mattress saves much time and adds enormously to one's comfort. It should be used with a sleeping bag and an extra blanket between bag and mattress.

This season I, for the first time, used Tricouni nails and found them highly satisfactory, notwithstanding the fact that I weigh in the neighborhood of 240 pounds when fully equipped. It was only on the occasion of my very fast descent over rough ground, when I went to stalk the tree trunk, that dislodged any of them. I lost three that day.

The country covered is shown on the map entitled "Rocky Mountains between latitudes 51 degrees and 53 degrees 10′," published by the Department of the Interior of Canada.

A TRIP TO MT. EDITH CAVELL

By H. E. Bulyea

Ever since my first glimpse of Mt. Edith Cavell from a G.T.P. car window during a trip through the mountains in 1918 I had longed for a more intimate acquaintance. The chance came last fall when some Edmonton people had been invited to share the hospitality of the Y.M.C.A. for a time after the regular camp period had expired. I was fortunate enough to be included in the list, and on Wednesday, the 3rd of September, we were met at Jasper station by the genial Secretary, Mr. Will Green, who escorted us to their well-appointed and beautiful camp on the shore of Lake Edith, four miles east of the town.

The first day in camp was beautifully warm and bright, but the next looked like a change to less agreeable weather, so we did not venture far from camp but joined a party going to Pyramid Lake. While there the expected storm came and we returned to camp, slightly damp but otherwise feeling fine after a very enjoyable outing. The next day it rained again and for several days we did little but sit about the big camp fire and prophesy about the weather or endeavour to cheer up those whose spirits seemed to droop in sympathy with their dampened crinolines. "All things come to those who wait," we told our fair companions and on Sunday we had our predictions verified when once more the peaks across the lake began to show through the mists. The beauty of the scenery had been added to behind the screen of clouds, snow covered all the upper slopes, and the sight was ample reward for all our patient waiting.

Next day I induced a young man, whom we shall call "Mac," to join me on the contemplated expedition to Mount Edith Cavell, and the following early morning saw us on our way, each carrying a blanket, a few sandwiches, a camera and other necessary articles. After a four-mile hike to town we took the trail running up the west side of the Athabaska, where a motor road was being built, and for about nine miles the going was good. The views along the river in many places were charming, Maligne Mountains to the left, Mt. Hardisty far up the river, the Whistlers to the right and our goal, with its mantle of white, much of the time showing straight in front; we had surroundings and incentive sufficient to suit the most fastidious.

About noon we reached the roadbuilders' camp at Astoria Creek where we tucked a good square meal under our belts, which somewhat added to our satisfaction and saved our own scanty hoard for future use. Then we crossed the bridge over the creek and began our ascent of a big hill where a gang of men were cutting out a "switch-back." Near the top we met friend Bruin coming towards us on the trail. The year before the greetings of the furry denizens had been brought by a brown bear, but this time a big black fellow came, who seemed anxious to have the agony of our acquaintance over in a hurry, so without much ceremony he handed over the freedom of the road and on we went.

The aforesaid "switch-back" when finished will be one of the attractions of the trip. It winds back and forth half-a-dozen times in making the crest of the hill (which must be five or six hundred feet in height) by an easy grade and the views on the way will be most magnificent.

Reaching the top we then took a pony trail which follows the edge of a table-land on the east side of the creek. About six miles further we found ourselves at an

old camp ground beside a small stream running into the main creek. This we took to be Cavell Creek and we followed it up for some distance before discovering our mistake. After retracing our steps we found the crossing a little farther down, and the well-marked trail led us at length to our goal.

Owing to this miscalculation and other side trips, partly intentional and partly otherwise, we did not reach our destination until nearly dark, but we found an old camp site at the foot of Cavell Lake and here we built a fire, spread our blankets on some fir boughs and turned in for the night.

Mac and I agreed to take turns at keeping the fire going, but evidently each thought the other not to be trusted, so we very frequently, during the first part of the night, went at the task together. Before morning, however, I became convinced that the other fellow was quite capable of performing his duties and I curled up in the blankets and was soon in the land of forgetfulness where I remained until broad daylight. On awakening we discovered to be true what we had suspected during the night, that it had been pretty cold up there near the glacier. The ground was frozen all about us, but our fire had done its duty very well and by frequent turns we had managed to avoid sharing the fate of our surroundings.

Soon the sun was shining on the glacier and we loaded our cameras and went down to the lake. It was a beautiful sight. The bright light on the ice and snow above mirrored in the dark water below were good to look upon, but not so good from the photographer's standpoint. The valley was in deep gloom and the snow-capped peak, a patch of dazzling brightness, made it a proposition for the camera man not easily solved. However, with the aid of ray-filters and numerous

Photo, Byron Harmon MT. EDITH CAVELL FROM NORTH

Photo, Byron Harmon

MT. EDITH CAVELL AND CAVELL LAKE

experiments in exposure, we managed to get what afterwards passed for fairly good pictures.

Striking as the scene was then, it was doubly so at night. The moon shone on the glacier and the awe and stillness, added to the deeper gloom of night in the valley, lent a fascination words cannot describe. I think whoever named that great mass of ice "Ghost Glacier" must have slept there too and watched it in the moonlight.

After breakfast we crossed Cavell Creek and climbed to tree line for the purpose of getting a view of the beautiful valley to the west. Here, from a rock-slide, I made an exposure. Feeling satisfied with the results of our efforts we descended, but subsequently, greatly to my disappointment, it was found badly out of focus and almost useless.

While photographically our trip was not a great success, in other respects it was eminently so. We had reached our goal under ideal weather conditions and had seen a beautiful country beyond—a country I understand that has been little explored and where the Alpine Club might in the future very profitably and enjoyably hold a camp.

Let me here also mention the fact that my companion, who proved himself a most agreeable and willing partner and who seemed almost not to know fatigue, had been denied the privilege of going to the war on account of a bad heart. Could they have seen him lead me up those twenty miles from Jasper to Cavell Lake with almost eight other miles thrown in on the same day I feel sure cardiac murmurs would have been disregarded.

Our return journey was uneventful. Another good meal at the construction camp and the balance of the journey in the moonlight stand out in our memories most, but I would not omit that most delightful sensation of tumbling into a comfortable bed at the end of a tiresome but very pleasant journey.

CLIMBING EPISODES OF THE WAR

By W. A. Wakefield

Episode I.

Poor fellow! His chance from the first was very slight.

I had been out of camp that afternoon and arrived back soon after the sad event had taken place. He had been fooling and playing about round the well, and had tumbled down.

The C.O. and a number of others, officers and men, had collected around the scene of the tragedy and were peering down into the deep darkness of the well and discussing what could be done.

It was about sixty feet to the water and the shaft was about eight or ten feet in diameter, with a strong three-inch pipe running down the centre. It had quite recently been cleaned out and repaired by the R.E.'s and it was our only water in any way fit for drinking, in fact, for all practicable purposes, our only supply. Something, therefore, *must* be done.

A glimpse was enough. The thing was obvious. A swift rush to camp and, in less time than it takes to write, back again clad in rubber shoes and old clothes and with a cord, a lantern and thin line. I tied the lantern on the line, gave clear instructions to lower the lantern alongside me and to throw down one end of the cord when I shouted, then, leaning over, seized the pipe and started down.

Going down was quite easy, and daylight and the voices at the top soon seemed far way, I wondered how

the ascent would go, and was immensely relieved to find that every fifteen or twenty feet the central pipe was supported by stout cross bars to the walls. In any case there was no need to worry about that yet, and the first job was to get down.

The lantern was regulated most skilfully from the top, and although the light was of a "dim, religious" order, still, I could just see the pipe I was clinging to and the cross bars when they came.

Towards the bottom the pipe was wet and covered with green slime; not very promising for the return trip!

Eventually I reached the water, but the light was so dim that very little could be seen. At first I could see nothing in the water, then I slowly began to make out something dark, the size of a man, floating motionless on the surface. I edged round on my perch, leaned over and grasped—a log of wood!

What a jest! I would give the fellows upstairs some work to do! So I shouted for the cord and after some trouble got a clove hitch around the log's waist and then gave the word to haul. And haul they did, all together, in tense expectancy, marvelling at the weight. Slowly it rose. I could hear their pants and groans, for it was waterlogged, and very heavy.

It had not gone up far before I realized what a fool thing I had done. My life depended on that cord as much as if I had been hanging by it over a two thousand-foot precipice. If it went—so did I. I took the best course I could, crouching under one of the crossbars However, the log was landed safely, and thereafter for some short time melodious voices floated down the well shaft expressing the innermost feelings of those who had just hauled up about half a ton of wood and water.

Again I glimmered round the dank blackness and at length descried a dark mass near the opposite wall,

scarcely showing above the surface. Again the cord came down and was firmly fixed round the soft, cold mass, which was then hauled to the top.

Now I had to make my way up—or else stay down. The swarm up the bottom slimy part was not as hard as I had expected, but, all the same, I was glad to reach the first cross bar, where I perched for a rest like a monkey on a stick.

Above this things went more easily, and I soon emerged at the top, rather winded, and thickly coated with green, slimy moss.

But the most unkindest cut of all was to find that we were not to get the rescued corpse for dinner, for the French stationmaster claimed it as his own.

So we solaced ourselves with the thought that he was nothing but a tough old rooster after all!

Episode II.

The Canadian Corps was following up close on the heels of the fast retiring Boche. We stopped for a day a few miles from the city of Namur. There being nothing for us to do I was lucky enough to be free to spend the day looking round the city, or what the Boche had left of it, and in talking to the natives, whom I found very friendly and quite ready to tell me about the sufferings that had been inflicted upon them during four years by the hated Boche. In many cases their eyes flashed and their voices quivered as they told of the horrors they had witnessed — the deliberate burning of the houses around the "Grande Place," and the shooting of the inmates as they tried to escape, etc., etc. The day was not long enough to listen to it all.

Then, by the courtesy of Monsieur le Maire, I was conducted over the citadel, built on a magnificent precipitous rock, wedged in the angle at the confluence of the

Meuse and the Sambre. On the summit of this rock the Boche had erected an exceedingly powerful wireless station—one of the most powerful, I was told, in the world.

So precipitate had been his flight that he had been unable to indulge in his favourite pastime of destruction, and the wireless station was intact, even to the Boche flag on the immense Marconi pole and the file of the copies of wireless messages dating back to the early days of the war. I glanced through these and found one sheet on which was written their own message in Boche, an intercepted British message in English, and a similarly intercepted French message in French. This sheet I pocketed as a souvenir.

Although it was only a few days since the Boche had evacuated the place, our British signallers were already busily at work there using the enemy plant which, they told me, was complete in every detail.

May I digress a moment to relate a story I heard in Namur which is worthy of repetition?

During the enemy occupation here, as everywhere else, he had requisitioned all the brass metal work he could lay his hands on. Most of the brass name-plates, door handles, kettles, candlesticks, etc., were, of course, buried or otherwise hidden, and the Boche got very little and was much annoyed.

So hurried was his retirement after the armistice that the Boche columns, weary and footsore, marched through the city in desperate haste, scarcely stopping even for food, and throwing away their equipment as they marched. Every sort of thing, from huge guns to steel hats, from transport waggons to gas masks, was littered in profusion by the sides of the roads along which they had passed. The Belgians, quick to make the most of their chance, dug up their kettles and candlesticks with

all haste, strung them on a rope high up across the street, and jangled them merrily above the heads of their departing oppressors as they jeered at them from the windows. The chagrin on the faces of the foiled despoilers added hugely to the general merriment.

Some three months after our first visit to the city, we were again in Namur. This time we were returning from the Rhine where we had formed part of the army of occupation. While in Bocheland those of us who had eyes to see and ears to hear had learnt to abhor and detest the loathsome Boche more, if possible, than ever before.

Again I went up to the Citadel. It was a bitter cold day, hard frost with a biting, piercing north wind, and snow on the ground. Admission was not so easy as on the previous occasion, but eventually we obtained permission, and soon we were standing on the top of the rock gazing out over the frozen landscape and shivering in the icy wind.

I happened to glance up at the huge Marconi pole. How high it was I don't know, but it was very tall even for a Marconi pole. And the Boche flag was still floating near the top! Incredible, but true! There it had been allowed to fly for more than three months.

The climb was easy. Iron staples had been fixed into the pole for steps, and although the intervals were so big that it was a decided stretch to reach from step to step, still the holds were sound and ample—but, oh! they were cold!

The climb, as such, was nothing. The only question was, could I get up, secure the trophy, and down again before my hands got too numb to hang on to the staples? The big intervals made it necessary to go somewhat slowly and to exercise care, but, realizing that the sole difficulty was this matter of the cold, I started up as hard

as ever I could go, for my fingers now-a-days get numb very easily and then they are as much under my control and almost as nearly "foreign bodies" in medical phraseology as are the legs of the chair I am sitting on.

Soon the cold staples began to sting even through the thick woollen gloves I wore, nevertheless I had to slow down, partly because I was getting out of wind, partly because a height had by this time been reached when caution became a natural instinct.

A little higher I came to the junction with the first extension pole. Here the arrangements of the staples changed and there was an extra big interval. Moreover, some stays and crosswires had to be dodged. Speed, therefore, was again slackened and the temperature of my fingers again dropped a few degrees.

The wind was now rather trying and *horribly* cold. Fortunately, however, there was still some feeling in my hands when I reached the flag, for it had become entangled in some stays and wires and I had considerable difficulty in freeing it. To do this I had to wedge myself on as best I could with my legs in order to use both hands for getting the flag, for I knew that every moment was of value.

By the time I had got the flag my hands were almost too numb to stuff it into my pocket. At last I got most of it crammed in; then I clapped my hands to try and get a little sensation into them before commencing the descent.

After descending a bit I realized I could not get to the bottom before losing all power in my hands without another stop to warm them up, so I chose a spot where the pole was still thin enough to enable me to get a fair grip of it with my legs, and I swung my arms and clapped my hands against the pole as well as I could and thus managed to regain just a little sensation. Then, down-

wards with utmost haste, for below this the pole was too thick to enable me to repeat the performance however powerless my hands became.

Half way down the bottom pole I had to slow up a bit again. All sensation had gone from my fingers, though I still had power enough to keep them bent, and to hang on if the hook thus formed got properly placed on the staples, but if once placed insecurely I should have been quite powerless to recover the grip. At each step, therefore, I had to make quite sure that my "hook-hand" was correctly placed before trusting myself to it. And even this amount of control was rapidly freezing out of my fingers. I still had my wrists in reserve to hang on with, but I did not want to trust myself to them if there was any possible way of avoiding it, for my grip with them would have been very insecure.

Now I was near the bottom, but my fingers felt about as strong as a piece of raw beefsteak.

The last step—on to *terra firma*—and I really wasn't sorry!

And my fingers? Yes, thanks. They're warm again now. It's over a year ago.

And the flag? Well, it's a trophy worth having.

IN MEMORIAM

JAMES MELVILLE MACOUN, C.M.G.

James Melville Macoun was born in Belleville, Ontario, in 1862. He was the son of Professor John Macoun, who, with all due deference to well known predecessors, may be termed the founder of Canadian Botany, and who survived his son but a few months, passing away with his keen intelligence unimpaired under the weight of nearly ninety years.

When only nineteen, James Macoun assisted his father in field work in the then remote district of the Assiniboine River. He definitely entered the service of the Dominion Government, in which his life was spent, in 1883.

No branch of natural history was alien to his interest. Although botany was his chief study, he had the eyes to see, the brain to understand and the vivid perception to appreciate the phenomena of the biological world. Nor did the limits of so vast a subject confine him; in 1884 he made extensive collections of Cambro-Silurian fossils in Manitoba, both in the Red River Valley and on the western shores of Lake Winnipeg. Mr. Macoun collected natural history specimens at various periods around Lake Mistassini in Quebec, from Lake Winnipeg to Hudson's Bay, around James Bay, along the Athabaska and Churchill Rivers, and in British Columbia. His knowledge of the flora and fauna of an immense country was great, definite and exact.

When in 1891 the long smouldering dispute concerning the fur seal in the Northern Pacific resulted in positive action, Mr. Macoun, as secretary to Dr. G. M. Dawson, the Director of the Geological Survey of

Canada and also Behring Sea Commissioner, went to the Northern Pacific to study thoroughly the habits and life history of the seal. The results of his work were so valuable that he was retained to follow them up during 1892 and 1893, and was sent to Europe in connection with the Fur Seal Arbitration. In 1896 he again went to Behring Sea and also in 1914. In 1911 he was one of the representatives of Canada at the Fur Seal Conference at Washington, D.C. In recognition of his services in connection with these investigations, the Imperial Government conferred on him the honour of the C.M.G.

For the International Exhibition in Paris in 1900 Mr. Macoun brought together a magnificent collection of Canadian forestry products and revealed to Europe the vast timber resources of the Dominion. While in Paris Mr. Macoun attended the International Congress of Botanists and signed on behalf of Canada the recommendations to govern botanical nomenclature, which later became the Vienna Rules. The United States has preferred its own system of nomenclature and minute subdivision of genera, and visiting botanists are sometimes confused in comparing notes in this country.

In 1903 the call from the Peace River district began to be heard, and Mr. Macoun, having made a thorough investigation into the character of the soil and of the climate, presented a report of outstanding value.

In the intervals of these special investigations, Mr. Macoun continued his normal biological work over the length and breadth of Canada. In 1909 he spent much time in assisting his father in the preparation of the valuable "Catalogue of Canadian Birds." The "Flora of the Ottawa District" was another worthy result of his labours. His remaining years were spent in the west, in Alberta, on Vancouver Island and on the islands of the Gulf of Georgia. During 1918 and 1919 he made a most thorough botanical survey of Jasper Park, Alberta, as our own pages bear witness.

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JAMES MELVILLE MACOUN, C.M.G.

Mr. Macoun was appointed Assistant Naturalist in the Geological Survey in 1898, Botanist in 1917, and chief of the Biological Division in 1918. He passed away after a severe illness on January 8th, 1920.

No one could meet Mr. Macoun without appreciating the quickness of his understanding, the lucidity of his thought and his appreciation of the relative values of facts presented to him either by his own observation or the report of others. Good work was his ambition, advertisement his derision.

Although his avocations prevented him attending the Camps of the Alpine Club of Canada, he was an enthusiastic member, always ready to assist the best interests of the Club and highly appreciative of the work the Club has done and is doing for Canada.

To his family and friends, so intimately connected with the Club, we extend a true sympathy.

S. H. Mitchell.

HERMANN WOOLLEY

The death of Hermann Woolley at the age of seventy-four, has removed one of its most distinguished names from the list of our Honourary Members. A born athlete, he was well known in Lancashire in his younger days as a football player and a boxer, and for some years was amateur champion of the middle-weights of the county. His name appears among the early records of ascents of the Pillar Rock, in the English Lake country, but he did not commence regular mountaineering till his fortieth year. He then began at once to make Alpine history, and, after a brief but strenuous apprenticeship in Switzerland, betook himself to the Caucasus, and was one of the most prominent among those who accom-

plished the conquest of the central portion of that range; indeed his list of ascents of the greater peaks is probably unrivalled by any other climber.

A few years later he joined Dr. Collie and Mr. Stutfield in the well-known expeditions which opened up the region between the C.P.R. and the headwaters of the Athabaska, and later still he made many new and notable climbs in the Lofoten Islands and Arctic Norway,

As President of the Alpine Club (1908-1910) he won the affectionate regard of all who came into contact with him. His unselfishness and imperturbable good nature were proverbial, and he himself used to attribute his successes as a pugilist to the fact that the other fellow always lost his temper first. Those who journeyed with him into the wilds were wont to describe him, with little variety of phrase, as the ideal travelling companion, and the many friends who mourn his loss could wish him no finer epitaph.

A. L. Mumm.

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From the Alpine Journal

HERMANN WOOLLEY
President of The Alpine Club 1908-1910

ALPINE CLUB NOTES

Affiliation with "The Alpine Club" (London, England)

At a General Meeting of The Alpine Club, held at its headquarters, London, England, on the 1st June, 1920, the following resolution was passed: "Resolved that a formal request by the Alpine Club of Canada to be affiliated to The Alpine Club be cordially acceded to."

The result set forth in the above resolution is the climax of a series of very friendly relations, which it is ardently hoped will lead to still closer ones. They began in 1907 when The Alpine Club of Canada was holding its Annual Camp, at Paradise Valley, near Lake Louise. While the Camp was in session an invitation was received by the present Director — then President of the Club — to attend the Jubilee celebration of The Alpine Club on the occasion of its fiftieth anniversary. The President travelled to London and attended the great dinner, held at Lincolns Inn Hall, and the other functions which marked that special occasion. As representative of The Alpine Club of Canada, who had travelled many thousands of miles over land and sea to attend, he was treated with high honour, meeting at the gathering many of the most famous alpine men of the day for whom the membership of The Alpine Club is so specially noted. Subsequently, he was elected an Honorary Member of The Alpine Club, being proposed for that most distinctive honour by the world renowned mountaineering veteran, the late Edward Whymper, the hero of the Matterhorn.

In 1909, The Alpine Club of Canada built and opened its Club House headquarters at Banff and held a specially designed Annual Camp at Lake O'Hara meadows. An invitation to attend this camp as the guests of The Alpine Club of Canada was sent to the President and members of The Alpine Club. A party of twenty accepted the invitation and The Alpine Club of Canada had the honour of entertaining as its guests at the Club House and at the O'Hara Camp a number of mountaineers well known in many parts of the world: Whymper, Mumm, Solly, Hastings, Fynn, Amery, Dixon, Pilkington, Bartleet and others. A specially arranged six-day trip around the Yoho Valley, via Sherbrooke Lake and Niles Pass above timber line was planned and carried out successfully, twenty volunteers of our young stalwarts carrying on their backs all the necessary paraphernalia for camping, over the passes and across the glaciers and snowfields. The expedition was brought to an end at Mt. Stephen House, in the Kicking Horse Pass, by a sumptuous dinner at which the members of The Alpine Club of Canada on the expedition were the guests of the visitors from The Alpine Club.

Again, in 1910, Dr. Tom Longstaff, the well known Himalayan explorer, and his sister were the guests of the Alpine Club of Canada at its Annual Camp in Consolation Valley, near Moraine Lake. On this occasion an expedition was organized up the Bow Valley and to the Yoho Valley via Vulture Col.

Since then a number of our Annual Camps have had representatives from The Alpine Club, notably Collie, Mumm, Eaton, Howard, Haskett-Smith and Earle. The result has been the majority of the above names are enrolled among our members as Honorary, Life and Annual members—chiefly Life Members.

During the world war the enthusiastic and whole-hearted cooperation of the Dominion of Canada, in conjunction with other Dominions of the Empire, with the motherland led to a feeling of kinship and camaraderie that brought the component parts of the Empire very close together. It was with this feeling strongly in being that the subject of affiliation was broached to Captain J. P. Farrar, the President of The Alpine Club and to Mr. A. L. Mumm, Vice-President. The plea was made on the ground of closer ties between the mountaineering clubs of the Empire and that the parent club—the oldest and most famous of all Alpine Clubs—should extend its patronage and prestige to the clubs representing great mountaineering centres of the Empire.

The discussion was finally decided at a General Meeting of The Alpine Club by the resolution of the 1st June, 1920; and on the 21st June the following official letter was sent:

"Alpine Club,
"23, Savile Row, London, W.1.
"June 21st, 1920.

"Dear Mr. Wheeler,

"I have much pleasure in informing you that at a General Meeting of The Alpine Club, held on the 1st June, the following Resolution was passed:

" 'Resolved, that a formal request by The Alpine Club of Canada to be affiliated to The Alpine Club be cordially acceded to.'

"I may add that it was not only passed, but passed with acclamation, and I need not say how much pleasure it gives me to be the vehicle of this information to you.

"I wish you all success at your Camp and I am extremely sorry that I am unavoidably prevented from availing myself of your kind invitation.

"I am, yours sincerely,
"J. E. C. Eaton,
"Hon. Secretary.

"A. O. Wheeler, Esq.
"Sidney, Vancouver Island,
"British Columbia, Canada."

Under date, the 10th June, the President of The Alpine Club wrote as follows:

"My dear Wheeler,

"At the last meeting of The Alpine Club the question of the affiliation of The Canadian Alpine Club to The Alpine Club was discussed and I am glad to say that the resolution was carried unanimously.

"I am sure that the bringing together even in a small way of the two clubs will have excellent results; for in the future all the new alpine work will be done out of Europe and we look to the

younger clubs to forward the good work. Mt. Logan and all the great ice world behind Mt. St. Elias has to be explored and Canada has yet thousands of virgin summits.

"Yours sincerely,

"J. N. Collie."

The above letters were read at the Annual Camp of The Alpine Club of Canada at Mt. Assiniboine last summer, when the Club's members gathered to extend an official welcome home to the returned members on military service overseas during the Great War. The letters were received with enthusiastic acclamation, which was gracefully acknowledged by Mr. A. L. Mumm, who, together with Mr. J. A. Osler, were the two representatives of The Alpine Club present.

It is needless to say how greatly the honour is appreciated by The Alpine Club of Canada and it is sincerely hoped that the measure of affiliation now in force will tend to bring a larger number of The Alpine Club's members as visitors to the Canadian Rockies, and that those who may come will not fail to take the fullest advantage of any facilities and courtesies it may be in the power of The Alpine Club of Canada to offer at its Club House and Camps, or in any other way possible; also that their experience and example in mountain craft may help bring to a high standard the efficiency of the young club that now represents the great mountain ranges of Canada.

There still lie between and beyond the lines of transcontinental railway wide tracts of mountains that are practically "terra incognita" which offer much inducement to the explorer and mountaineer, where snowclad peaks pierce the clouds, where icefalls sweep from great heights, where wide snowfields bridge wide, rock-bound basins and deep, dark valleys carry rushing, foam-crested torrents in their trackless depths.

Arthur O. Wheeler,

Director.

Ascent of the Northeast Face of Wapta

From the site of the A.C.C. camp of 1919 the truncated cone of Mt. Wapta was the dominating feature of the landscape, forming a picturesque background to beautiful Yoho Lake and challenging the mettle of the climbers. The ascent of Wapta by the usual route over the terraces of its northwest side, overlooking Emerald Lake, is easily made; but the bold cliffs facing to the north and northeast offered little encouragement to those who, from the lounging places of the camp, scanned the precipitous rocks in search of a feasible route. The more one studied the problem, the more fascinating it became, until the conjunction of a favourable day and absence of any particular programme overcame the last excuse.

A leisurely and somewhat belated start brought Mr. Andrew Sibbald and the writer over the scree slope to the snowbanks at the foot of the cliffs at eleven o'clock. If we had gone no farther, the effort would have been well repaid by the wonderful view of the Yoho Valley from this point. It is to be regretted that every

member of the camp did not make the slight effort necessary to enjoy this rare scene.

The closer view of the rocks was not especially encouraging. One or two deep clefts, although worn very smooth, might have afforded a start but they ended higher up in overhanging slabs. Working up from the snow through a narrow gulley to the foot of the wide chimney near the northeast angle of the cliff, we turned to the left, going up rather steeply over the convex face of the rock with small hand and foot holds. The rock was firm and very dependable, but with small fractures and few standing places. We gradually traversed the face of the cliff toward the left while working upward, occasionally changing direction to take advantage of a more favourable lead. Progress was slow because of the constant necessity of searching for holds. For an hour or more we moved slowly forward with no opportunity for rest or relaxation. By this time we had crossed well over toward the eastern outline of the cliffs as seen from camp and ascended perhaps three-fourths of the distance to the summit crest, the general route lying from the lower right to the upper left of the northeast face. The slope now became less steep leading to a comparatively level bench or recess at the foot of two or three almost perpendicular chimneys, with the open sky at the top. Choosing the one at the right in spite of its actively operating shower bath, fifty feet of good climbing over firm rock with excellent holds brought us onto the deep snow cornice which crowned the cliff. Following this a few steps to the left led to the high point of the crest from which it seemed almost possible to toss a stone into the waters of Yoho Lake, brilliant in varying shades of blue.

During the two and a quarter hours in which we had been "spread-eagled" on the rocks, there had been no dull moment and we voted it a most "sporty little climb." An extemporized heliograph apprized the camp denizens of our success just as they were leisurely dispersing from lunch. Improvidently we had brought no food and the customary summit ceremonies were postponed until, traversing the ridge to the southwest, we joined the regular route of descent and following the trail through Yoho Pass, reached camp in time for afternoon tea.

W. E. STONE.

Peace Day on Scafell Pike

A week before the great event some of the Fell and Rock Club members had taken ponies up on to Esk Hause, each carrying two flares. The flares had been provided by the Government, and were said to have been left over from the Zeebrugge fight, and to weigh ninety pounds each. Esk Hause is the furthest point towards Scafell which ponies so laden could reach. This gave us a good start for our Peace Day labours.

About twenty-five members assembled in Langdale, and at 10 a.m. set off towards Scafell. A cart took the impedimenta the first mile and a half or so to the foot of the Stake Pass. From that point we had to pack everything ourselves. The baggage consisted of a 20-foot flag pole and Union Jack (I was detailed by the Master of Ceremonies to help with these). Then there was a big bundle of

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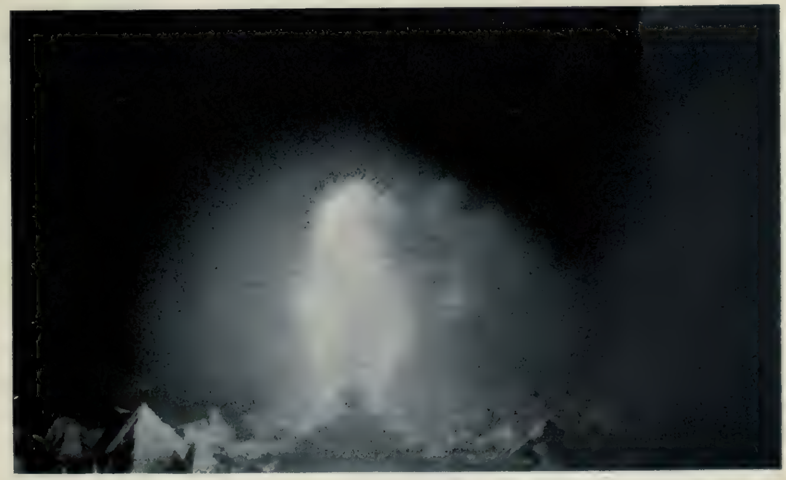
Photo, H. Pollard NORTH-EAST FACE OF MT. WAPTA AND YOHO LAKE

Photo, E. J. Moorat
CART WITH GEAR LEAVING MIDDLEFELL FARM

Photo, W. A. Wakefield
PEACE DAY CELEBRATION
The highest Flag in England on Summit of Scafell Pike

Photo, J. P. Rogers
CARRYING UP MATERIAL TO SUMMIT OF SCAFELL



Photo, A. E. Ling
THE SUMMIT OF SCAFELL AT NIGHT
A Flare Flaring

large rockets and arrangements for sending them off, wood and coal for a fire, grub, extra garments, etc., etc. Those who were not needed for these things went on ahead to pick up the flares on Esk Hause.

The rest of the caravan slowly wended its way up Rossett Ghyl, which is steep and rocky. The flag pole was very awkward here, and the coal was very heavy, but by keeping slowly at it we eventually reached the top, where a halt was called for lunch. Then we dropped down to Angle Tarn, in whose deep black waters most of us refreshed ourselves with a swim. Then "excelsior" on to Esk Hause and over the great rugged boulders of Broad Crag and Ill Crag and up the last steep slope of Scafell Pike—the highest point in England.

On arrival we found that the advance guard had not been numerically strong enough to bring up all the flares, so a number of us retraced our steps to Esk Hause to lend a hand. Eventually we got everything safely landed on the summit about 7 p.m.

By this time the flag pole was firmly planted on the top of the big cairn, and the strong breeze was proudly displaying the Union Jack to the greatest possible advantage. It looked well to see the old flag flying up there, and we knew that of the many thousand flying in England that day, ours was the highest.

There had been heavy rain the night before, and heavy clouds on the hills had been slowly rising all day. About this time the weather cleared beautifully, and we enjoyed one of the finest sunsets it has ever been my privilege to see. The lights and shades on the great Scafell crags, on Great Gable, in fact on all the hills and lakes in view, surpassed description and, our work all being done, we could sit and drink it in to the full.

After sunset we had an hour or so to wait till eleven o'clock when the flares on the different mountains were to be lit. The time passed almost too quickly as the ladies dispensed tea in the shelter and we sat and smoked and talked. Just before eleven a signal rocket was sent up. Then the bugle sounded and, exactly at eleven, our first flare was lighted, and simultaneously some fifty flares on hills and mountains shot up into the air. It was a sight for ever to be remembered, but one which I cannot describe. The illuminations lasted till midnight, then we smoked, talked, sang or tried to sleep till dawn, when we could see to make our different ways downwards and homewards. None of us, I think, will ever forget that night.

A. W. Wakefield.

REVIEWS

South—By Sir Ernest Shackelton*

The world's attention, focussed on the events of the great war, gave little heed to the tragedy enacted in the Antarctic during the first two years of the conflict. A momentary thrill at the news of the crew of the abandoned ship, marooned on an ice-bound rock in the uncharted southern ocean, and the final word of their rescue, barely hinted, even to those versed in South Pole explorations, the thrilling experience of which we now learn the details from Shackelton's fascinating recital.

After the conquest of the South Pole by Amundsen in 1911, closely followed by Captain Scott, whose fate was in so sad contrast to Amundsen's brilliant achievement, Shackelton conceived, as the last great adventure in the Antarctic, the crossing of the ice-capped South Polar continent from sea to sea. The daring of this attempt can scarcely be realized by one unfamiliar with the conditions. It involved a foot journey of 1,800 miles across a frozen plateau of 10,000 feet altitude, traversed by great mountain ranges, swept by furious storms, and devoid of all life, while to land the exploring party on the continental ice foot requires a voyage through ice bound southern seas in which the records of failure have far outnumbered the successes. Sir Ernest Shackelton, who in 1909 reached farthest south—97 miles from the pole—is without doubt the most experienced and well informed in Antarctic matters of any living man. His plan was to land a party on the ice barrier in Weddell Sea, opposite the southern extremity of South America, and from this base push on over the wholly unknown region some 1,000 miles in extent to the pole, there following the return route of Amundsen and Scott, to a pre-established base on the shore of Ross Sea opposite New Zealand. The actual scientific value of such an exploration is conceivably very great, especially to geological knowledge.

The expedition failed to accomplish its purpose through no fault of its determined leader or its members—crushed and beaten back by the overwhelming forces of ice and cold and the tumultuous elements of the Antarctic regions.

After months of the most careful preparation, the expedition, consisting of twenty-eight men, under the command of Sir Ernest Shackelton, sailing from London on August 1st, 1914, sensed the portent of the hour and offered to turn back for their country's service, but the Admiralty ordered "Proceed." From the remote whaling station on the island of South Georgia, 1,000 miles east of Cape Horn, the specially built ship, Endurance, turned her prow to the south on December 5th, 1914, and after forty-four days battle with the ice, was in close contact with the ice barrier of Coats Land, south latitude 76°, east longitude 30°, on January 18th, 1915. As

*The Macmillan Company, 1920.

it turned out, this was the nearest approach to the expedition's goal, for on that day the ship was gripped by the ice pack and drifted helplessly for nine months, moving in a northerly direction nearly five hundred miles in a straight line, but covering an actual route of nearly fifteen hundred miles. In this wilderness of floating ice, irresistibly driven by ocean currents and storms, the ship was an insignificant and helpless object threatened with destruction. "Huge masses of ice weighing many tons are lifted into the air," says the author, "and tossed aside as other masses rise from beneath them. We were helpless intruders in a strange world, our lives dependent on the play of grim, elemental forces that made a mock of our puny efforts."

On October 27th, 1915, the ship, crushed beyond all hope of rescue, was abandoned, the crew camping on the ice three hundred and forty-six miles from the land with stores and equipment rescued from the ship, together with three boats. "I cannot describe the impression of ruthless destruction," writes Shackelton, "the floes with the force of millions of tons of moving ice behind them were annihilating the ship."

A floating sheet of ice, about a mile square at first and later splitting up into smaller parts, was the home of the company for nearly six months. Supplementing the ship's supplies with occasional seals, penguins and the meat of the slaughtered sledge dogs, the party drifted northward until they reached the limit of the ice pack and on April 9th, 1916, took to their boats. After six days and nights of peril from cold, tempestuous seas and floating ice, a landing was made on the exposed rocky beach at the foot of insurmountable cliffs on Elephant Island, a mass of rocks and ice some five hundred miles southeast of Cape Horn. In these unfrequented seas there was no chance of rescue and it was at once decided to despatch a relief party in one of the boats. The Falkland Islands, five hundred and forty miles to the north, were the nearest inhabited land, but the more favourable winds decided in favour of an attempt to reach South Georgia Island, eight hundred miles to the eastward. At this juncture, as at all times, Shackelton proved himself the real leader. Selecting five of his strongest men, they set out on the desperate attempt and the story of their sixteen-day voyage in an open boat, over the roughest seas in the world, is an unequalled record, exhibiting the highest degree of courage and dogged endurance of which human beings are capable. "There was no rest, no warmth, no water, no comfort, not a stitch of dry clothing. Our bodies were worn, raw and frozen. We thought at the time that we never slept." The voyage culminated with a hurricane which threatened inevitable destruction and held them standing offshore for two days after sighting land. Battered, frozen and exhausted, they were literally flung ashore by the waves at the breaking point of their strength, but on the opposite side of the island from the settlement. Rested and strengthened by a meal of the flesh of young albatrosses, they braced themselves for the supreme effort of crossing the island. Three men were left behind and rescued later, while Shackelton with the two strongest of the men in a struggle of thirty-six hours' duration, fought their way across two ranges of 4,500 feet altitude, traversing glaciers, cutting down precipitous ice slopes and adding to their laurels, as seamen, others as mountaineers. The ship's adze served as an ice axe.

Looking down from the last crest they saw the little settlement, boats at anchor and people moving about. The descent was literally through a waterfall, from which they emerged drenched to the skin, with the trusty adze, log book and Primus cooker, "all that we brought out of the Antarctic which we entered a year and a half before with a well found ship, full equipment and high hopes."

No time was lost in organizing the rescue and in a few days a steam whaler was speeding to the relief of the men on Elephant Island. But the ice pack had drifted north and the vessel was halted seventy miles away, retreating, after a few days of futile cruising about, to the Falklands, whence the first news of the expedition reached the civilized world, June 1st, 1916. Three more attempts to reach Elephant Island were made with vessels supplied by South American Governments and finally, on August 30th, the appearance of the little Chilian steamer Yelcho gladdened the eager eyes of the twenty-two waiting men whose sufferings constitute another chapter in the epic of human courage. Sheltered by two overturned boats, they had existed on this barren rock more than four months on short rations, threatened by encroaching seas, buffeted by tempests, frozen, wet and starving. Their leader, Wild, proved a tower of strength and resourcefulness, maintaining discipline and a semblance of good cheer to the last. Happily, the entire party of twenty-eight men reached England safe and sound.

Meantime, from New Zealand, the other branch of the expedition had been carrying out its duty of landing a depot party on the shore of Ross Sea, and proceeding inland on the route of Captain Scott to establish depots of supplies for the transcontinental party, under Shackelton, on its way from the pole. The ship Aurora, after landing the party, was driven offshore and disabled. The depot party lost three men, Mackintosh, Hayward and Smith-Spencer, and after passing two winters on the shores of McMurdo Sound, was in sore straits. Shackelton immediately bent himself to the task of their rescue, which was accomplished in January, 1917.

Not daunted by their racking experiences in the Antarctic, the fifty-three surviving members of the expedition joined the active fighting forces of England, where three were killed and five wounded.

The story of the struggles, disappointments and endurance of this little band of Englishmen striving in the vast wastes of the Antarctic to accomplish their task, takes its place even among the superhuman deeds of the war, to the glory of human courage and achievement.

W. E. Stone.

On the Edge of the World—By Edmund Candler*

"He loved wandering for its own sake, like an Englishman." This quotation from our book might well be taken as its motto. It tells of wanderings in Kashmir, to the Khyber Pass, around Nanga Parbat, and in Mesopotamia and Persia in war time—a far cry.

To a mountaineer the most interesting story is the journey around Nanga Parbat, that magnificent mountain on which Mum-

*Cassell & Co., London, New York, Toronto and Melbourne

mery and his two native companions disappeared into the unknown twenty-five years ago. "It is true Nanga Parbat is not the highest mountain in the world—there are three or four peaks higher; but there is no rock-face anywhere comparable to the drop from the summit, 26,620 feet, on the northwest to the bed of the Indus nearly 24,000 feet beneath. . . Nanga Parbat, the incomparable, alone reveals her whole naked majesty and beauty, rising from the river bed in Chilas at a little more than 3,000 feet above sea level to as near heaven as may be."

"When one is directly under a peak which one has not seen from the base, the intermittent glimpses revealed through floating cloud, suggestive of a hidden majesty and aloofness, impress one more than the complete revelation under a clear sky. Perhaps, when the curtain seems irrevocably drawn, you look up and see a black precipice, a hanging glacier, a red-veined rib of rock, framed momentarily in a patch of blue, higher in the sky than you believed possible, and then, higher still, an outline of the mountain's white glistening rim, so infinitely remote that you cannot imagine earth raised above it until, near the zenith as you think, deceived by the cloud perspective, the real summit swims into view. Early the next morning, perhaps, just as the moonlight is merging in the false dawn, you look out of your tent and see the whole massif, with all its unexpected satellites, sovereign peaks in any other chain. Your pulse may beat quicker, but when you think of the mountain afterwards, it will be the cloud-swept soaring summit, with the rosy mists gathering and dissolving, that you will remember as the true divinity."

There is a sympathetic account of the pilgrimage to the sacred cave of Amarnath. "The West sees God's hand most clearly in what is beautiful; the East in what is, or seems to be supernormal. The two quests often lead along the same road. So it is on a pilgrimage that East and West are nearest meeting. Even so they do not meet, but move in close parallel lines."

Those to whom the still unprofaned lakes of the Canadian Rockies are familiar will appreciate the interpretation of the spirit of a lake in Kashmir. "The still lake of Gangabal, which sleeps in the bosom of Haramokh, may well symbolize the eternal peace. There is nothing here to detach the mind from the everlasting. Here, if anywhere, the soul of man may be made one with Nature. So the Kashmiri asks that, when his unhappy spirit is dismissed to wander through its endless cycle of rebirths, the one enduring part of him which has survived the flames may be lapped in the green waves beneath the glacier, rolled in the oozy granite bed, and become an indestructible part of the material world, laid upon the supreme altar, in the deep lake, among the foundations of the hills."

Mr. Carpenter gives a striking account of the famine in Kermanshah: "The plague and misery with which the Hun has infected the world is more manifest the farther one gets from the hub of the evil. . . It is only when one finds the shadow of the angel of death flung over the mountains and deserts of Asia that one realizes how complete is the sway of the devil raised in Potsdam." As in Italy after Caporetto, the British relief work was regarded by many as a political move; "So in Teheran, when the English ladies established kitchens and fed the famine-stricken, the papers were

sarcastic, saying, 'The British are cunningly seeking to glorify themselves.' To such intellectuals one prefers the wolfish pack."

The author concludes: "After Mesopotamia I desired Arcadia. . . . . Bare mountain tops will never appear frightful and depressing again as they did to our ancestors. Yet among the changes wrought by war in the human spirit there may come a preference for the sylvan and pastoral upper places. We loved wildness when there was peace, and sought it. Now we have had our fill of savagery, it will not be strange if a bias enters our spirit and turns us from what is wild and wasteful in Nature to the old Arcadian haunts of Pan and the shepherds."

S. H. Mitchell.

Mountain Memories: A Pilgrimage of Romance.
By Sir Martin Conway*

"From time to time God causes men to be born who have a lust to go abroad at the risk of their lives and discover news—to-day it may be far off things, to-morrow of some hidden mountain." These words of Lurgan Sahib sum up the impressions of this book. Sir Martin Conway is far removed from the modern enthusiast who sees mountains principally from the viewpoint of the gymnast, as problems in rock climbing. To him are revealed the treasures of the snow, and he is possessed with the desire to plunge into the unknown—a pilgrim of romance. He has wandered far — from northern Spitsbergen to Tierra del Fuego, from the Himalaya to the Andes. Switzerland, Italy, "gardened England," he knows them all. To all enthusiasts, romantic or mathematical, to all who have imagination, there come dry periods when nothing seems worth while, but a change to other scenes, a rest, and the old charm is as potent as ever.

Naturally his climbing experiences began with the Alps, the training ground of climbers and mountain adventurers, where methods that are right as well as traditional are learned for life. "The world of ice and snow was no longer an utter mystery. It retained its aloofness, but had ceased to be altogether foreign. . . Reverence grew with knowledge—reverence which is 'the chief joy and pride of life.' Who that has once felt it can ever forget the majesty of the high white world, overwhelming in glory as in gloom?"

Then came the call of the East. At first it was proposed that Mummery, that greatest of climbers, should be his companion; but, "the more I knew him the more I liked him and the more evident it became that his attitude toward mountains was fundamentally different from mine." He lacked the aesthetic catholicity which strikes one in Sir Martin Conway's book. His crowning mercy was the adhesion of C. G. Bruce, now a name of power in Himalayan history. The story of this adventure is told in Sir Martin's well known book. A new world of wonder was opened. The terrific gorge of the Indus, the Hispar Pass, the Baltoro Glacier, all made an ineffaceable impression. "The world has seemed to me a more majestic place ever since. . . Everything was gigantic. Our eyes had adjusted themselves to new units of measurements and could

*Funk & Wagnalls Co., New York and London

see things as they actually were. For me those were great days—days of high romance. Wonder pervaded them. Dawn, noon and eve—the frosty, starlit night, storm, sunshine and all the progress of the hours were laden with a felt insignificance."

Another visit to the Alps resulted in "The Alps from End to End" and infinite staleness. Romance had fled and the hunger for the commonplace was strong.

In its turn the romance of the commonplace also vanished and the imperative call to wider fields was answered. Spitsbergen, the Andes, Tierra del Fuego, all were visited and all interested, though the peaks of the Andes seem to inspire our author with that personal dislike which is so curiously general among the climbers who visit them. Finally, our author climbed again the Zermatt Breithorn as a farewell to snow mountains. "The view embraced all my hoary-headed friends. Scarcely a peak of any importance was in sight on whose summit I had not stood. I saluted them for the last time, but not regretfully. They had given me health, joy, beauty, friends and rich memories. Those I was not going to leave behind. They are still mine and infinitely precious."

The book is nicely produced, but the illustrations seem scarcely to do the original photographs justice.

S. H. MITCHELL.

OFFICIAL SECTION

REPORT OF THE VICTORY CAMP

The fourteenth Annual Camp—the Victory Camp—was held in Yoho Pass on the shore of its blue lake from July 22nd to August 5th, 1919.

It was felt that after the long years of war no more appropriate spot could be chosen from which to draw fresh inspiration than the site of the first Camp of the Club, held in 1906. But five of the original members were able to be present, but the younger generation carried on the tradition of thorough work.

The Camp was rendered of exceptional interest by the presence of soldier members who had greatly distinguished themselves during the war. The attendance was larger than at any Camp since the fateful one of 1914, and vital interest was maintained to the end.

In the midst of a very dry summer, the Camp experienced a spell of broken weather, rendering plans difficult of execution at any definite date. The sunshine was the more appreciated and the afternoon thunderstorm accepted with equanimity.

A subsidiary camp was pitched near the mouth of the Little Yoho Valley, from which the greater part of the climbing was done.

The main camp was of much interest to the wandering tourist who was not intrusive and was grateful for accurate information and lucid direction.

There were present members of the English, Swiss and American Alpine Clubs, the B.C. Mountaineering Club, The Appalachian Mountain Club, Colorado Mountain Club, The Mazamas, The Sierra Club and The Royal Geographical Society. One hundred and twenty-nine were placed under canvas, drawn from the following places:

CANADA

British Columbia: Cameron Lake, Erickson, Invermere, Sidney, Vernon, Vancouver, Victoria and Wilmer.
Alberta: Banff, Calgary, Edmonton, Grande Prairie, Irricana, Lethbridge, Macleod and Springdale.
Saskatchewan: Biggar, Regina and Saskatoon.
Manitoba: Winnipeg.
Ontario: Kitchener, Ottawa and Toronto.
Quebec: Montreal.

UNITED STATES

California: Berkeley
Connecticut: Greenwich
District of Columbia: Washington
Indiana: La Fayette
Maryland: Annapolis
Massachusets: Boston and Cambridge
New Jersey: Orange, South Orange and Summit
New York: Brooklyn, New York, Saratoga Springs, Syracuse and Watervliet
Pennsylvania: Philadelphia and Pittsburgh

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Photo, H. Pollard

THE CAMP FIRE CIRCLE

EUROPE

France: Paris
Switzerland: Interlaken

THE ANNUAL MEETING

The Annual Meeting was held at the Camp Fire on the afternoon of July 30th.

The President's address expressed his envy of those present in Camp and his hope to be present in 1920. He declared his appreciation of the work done by the active members of the Executive, admiration for the members who had followed the flag on every field from Belgium to Mesopotamia, and sympathy with the desire of the Club to perpetuate the memory of the fallen. He alluded to the death of F. W. Freeborn, an original member, beloved by all who knew him. He made plain the demand for further scientific and exploratory work among the mountains, only to be satisfied by a larger membership, especially in the centres of learning.

The Director then read his report. He expressed his pleasure at the presence of Col. W. W. Foster, the Western Vice-President, and the fact that the Club had survived the difficulties of the war period. He then proceeded to deal with various matters to be considered for future action, the question whether Club dues should be increased, the raising the standard of the requirements for the Club badge, delegates to the Alpine Congress at Monaco, the Welcome Home Camp, the War Memorial and other subjects. He announced his intention of placing his resignation in the hands of the Executive that Club members might have an opportunity to express approval or disapproval of his war time policy. He alluded to the plan of the Walking Tour Route, now in existence. In closing, he expounded the gospel of the mountains which made great men and women, good citizens and patriots.

The Secretary-Treasurer submitted his report, stating that finances were improving, but that greater improvement was necessary to carry on the work of the Club to fullest advantage, and to establish its position among the great forces of Canada.

Mr. Wates read his report of the work of the Photographic Committee, which had made an excellent beginning.

The meeting then proceeded to new business. It was felt that the more contentious points enumerated in the Director's address would be more adequately discussed at the next Annual Meeting, when a full representation would probably be present. Delegates to the Alpine Congress were nominated, of whom Mrs. Henshaw only was able to act. The War Memorial was discussed, a committee appointed and in due course a subscription list opened.

Appreciation of the presence of Mrs. Wheeler in Camp after many years' absence was enthusiastically expressed, and the usual votes of thanks were passed. The meeting then adjourned.

REPORT ON MOUNTAINEERING AND EXPEDITIONS

As in 1906, Mt. Vice-President was the graduating climb. Owing to glacial shrinkage conditions had entirely changed, and the far less interesting route from the Little Yoho was taken by most parties, a few only making it directly from Camp. Other peaks

ascended, several more than once, were President, Des Poilus (formerly Habel), Marpole, Kerr, Michaels Peak, Burgess, Wapta and Field.

The large Yoho Glacier was found to be shrinking rapidly; the ice cave no longer existed and the face of the snout was exceedingly steep.

Various excursions were made in this delightful neighbourhood and a fishing party made a trip to the Amiskwi River.

In accordance with the unselfish tradition of the Club many skilled members devoted much of their time to assisting novices on their first climb.

The Swiss Guides were Edward Feuz and Christian Häsler. Their services were untiring and greatly appreciated.

Forty-seven passed the test for active membership. Their names follow:

July 25th

Mrs. W. W. Foster
Miss N. L. Walton

July 26th

Miss M. Colgate
G. Comstock, Jr.
C. H. Kimberly

July 27th

F. S. Dunn
R. D. Eggleston
Mrs. R. D. Eggleston
W. J. O'Brien
Mrs. W. J. O'Brien
A. C. Ruttan
D. J. McGeary
M. Stoddard
H. C. Sieburth
H. C. Willson
H. D. Hulbert
J. A. Mather
Miss L. Comstock
Miss D. Elliott
Miss H. E. Glyde
Miss G. Drinkwater
Miss L. Lowndes
Dr. Maud L. Menten
Miss A. Falconer
Miss S. H. MacVicar
T. O. A. West

July 29th

L. A. Duncan
L. D. Burling
W. A. McAulay
H. Heriot
H. M. Dunbar
Miss H. I. McGeary
Mrs. F. S. Dunn
Miss P. M. Innes
Miss M. H. Smith

July 31st

Mrs. M. Jack
G. Chelew
G. W. Grant
J. Rigby
— Jones

August 3rd

J. N. Gunn
E. H. Brock
A. Adams
Mrs. A. Adams
H. L. Newcombe
C. R. Adams
Miss M. H. Gold

SECOND ANNUAL REPORT OF THE PHOTOGRAPHIC COMMITTEE

At this time when so many matters of more vital importance to the Club require the attention of its members, the Photographic Committee is satisfied to be able to report progress. This is the second annual report of the committee and while its work may, perhaps, be regarded as merely a resumption of the former activities

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Photo, H. Pollard

AN IMPORTANT FEATURE OF THE CAMP

of the Club, necessarily suspended during the war, so long a time has elapsed that it has seemed wisest to grasp the opportunity to initiate new policies and to make an entirely fresh start.

Wise policies, successfully carried out, become established as precedents, developing later into customs and, in the course of time, into traditions. The Alpine Club of Canada is fruitful soil for the planting and cultivation of such traditions and much thought has been devoted to the end that the photographic work may become so interwoven with the other interests of the Club that it will be self-supporting, not alone financially, but inherently. The committee has refrained from attempting too much, realizing that the permanent nature of The Alpine Club of Canada gives ample time for growth along all lines.

The most important thing of all is to secure the help and co-operation of every member of the Club who uses a camera, whether they are experts or only beginners. This will depend largely upon the members of the committee, who are urged to miss no opportunity to impress upon the members of their sections the importance of photography as an aid to the regular work of the Club.

In last year's report, the various classes of work planned by the committee were stated to be as follows:—Print Collection, Lantern Slide Collection, Competitions. A brief summary of our progress along these lines will be given.

PRINT COLLECTION

Because the committee regards this as the most important branch of their whole work, it has seemed wisest to make haste slowly and not make a start until a really satisfactory method of filing and classifying prints has been evolved. Much work has been done towards this end and many suggestions have been received, notably from Mr. Herbert Frind, who has taken a special interest in the plans for the print collection.

We hope, early in the fall, to have cards printed for a proper catalogue of the Club pictures and slides, so that any print shall be immediately available, as explained last year.

The initial work of cataloguing prints will necessarily be heavy, and it will be best to subdivide the work among the members of the committee.

It is of the utmost importance that prints of all new pictures of interest be placed in the hands of the committee year by year. An attempt was made at the 1919 camp to carry out a scheme for the exchange of pictures taken at camp, but this was a failure, owing probably to the fact that it involved sending films to headquarters, a procedure to which many object.

LANTERN SLIDES

A start has been made towards the establishment of a Slide Collection. It will be remembered that the Director appealed to each section to contribute six slides in duplicate annually. The following sections have responded to the appeal this year:—Calgary, Edmonton, New York and Winnipeg. Slides have also been donated by the following:—F. N. Waterman, H. E. Bulyea, Leonard Lindsay and C. G. Wates.

With reference to the last named, it may be explained that the chairman of your committee having been offered a fee for delivering an illustrated lecture on mountaineering, accepted it for the specified purpose of adding some slides to the Club collection. May we suggest to the executives of the various sections that this offers a very easy way of raising the small sum necessary to pay for the annual quota of slides?

Many of the slides did not arrive until too late in the season to be of much use this year, but a set was made up and augmented by slides loaned by Dr. H. E. Bulyea and your chairman. This set was sent to Saskatoon and New York, at both of which places they were much appreciated.

Contributions of slides from individual members will be very welcome. They should be in duplicate as it is intended that a set shall be kept at all times at the Club House.

A very valuable donation was made by Mr. R. I. Raiman, who presented to the Club the collection of the late Prof. Freeborn a magnificent set of about 250 slides, covering a number of years during which Prof. Freeborn attended the Club Camps. This gift is especially appropriate in that Mr. Raiman has succeeded Prof. Freeborn as the New York member of the Photographic Committee.

One thing that is badly needed in connection with the Lantern Slide Collection is suitable cases for storing and shipping slides. Perhaps some way will be found to supply this need without imposing too great a strain on the general finances of the Club.

COMPETITIONS

The first competition since the formation of the committee was held last year at the Annual Camp. About forty prints were submitted, mostly enlargements, and were placed on exhibition in one of the tents. The judges, Miss E. Kirk, Mr. H. Pollard and Mr. B. F. Seaver, awarded the prizes in the various classes as follows: Class A (challenge cup), Dr. H. E. Bulyea; Class B, Dr. H. E. Bulyea; Class C, Mr. C. G. Wates.

The prints, many of which were of great beauty, constitute a valuable addition to the Club collection. They have since been mounted and exhibited in Victoria, Vancouver, Calgary, Edmonton, Saskatoon, Winnipeg and New York. Everywhere they have received most favourable comment and have attracted much attention. Lack of time made it impossible to send the set to the English section, but it is planned to give this section first choice on the itinerary for the coming winter.

GENERAL

The following changes have taken place in the personnel of your committee:—In Victoria, Mr. R. D. McCaw has been replaced by Mr. C. B. Reynolds; in Vancouver, Mrs. M. C. Johnston has taken the place of Mr. Herbert O. Frind, resigned; Mr. R. I. Raiman has filled the vacancy in New York left by the regrettable death of Prof. Freeborn; the new section in Saskatoon has appointed Mr. D. J. M. McGeary as its representative, and Mr. A. L. Mumm is acting for the English section.

At the 1918 Annual Meeting, when the Photographic Committee was appointed, no definite organization was arranged. A resolution

will be presented at this meeting providing for a two-year term of office for the members of the committee. If this resolution is passed your chairman's term of office will expire at the end of this year and I wish to take this opportunity to thank the members of the committee and others who have generally so willingly assisted in every possible way to make the inauguration of the new photographic policy a successful one.

CYRIL G. WATES, Chairman.

THE CLUB LIBRARY

Since peace was declared there has scarcely been time for any new mountaineering books to make their way to the Club Library.

The most important addition has been an old and standard work: The Exploration of the Caucasus, by Douglas W. Freshfield.

Mrs. Henshaw kindly prepared and presented a scrap book descriptive of the Alpine Congress at Monaco.

Among books we should like to possess are:

Mountain Craft. By G. Winthrop Young. London, Methuen & Co.
Mountaineering Art. By Harold Raeburn. London, Fisher Unwin.
Flora of the Rocky Mountains and Adjacent Plains. By P. A. Rydberg. New York.

The Pyrenees. By H. Belloc. London.

Trails, Trappers and Tenderfeet. By S. Washburn.

Major E. O. Wheeler has presented to the Club House a couple of enemy shell cases, which peaceably serve as flower vases and also an ash tray, brought from Mesopotamia.

Mr. H. S. Hall, Jr., has given a fine enlargement of his photo of Mt. Louis, which will be of abiding interest to climbers.

The list of additions follows:

Birds of Eastern Canada. By P. A. Taverner. Pub., Dept. of Mines, Ottawa. Donor, Department of Mines.

An invaluable work by a standard authority.

The Exploration of the Caucasus. By Douglas W. Freshfield. Pub., Edward Arnold, London. Donor, C. D. Creighton.

Adventures of a Nature Guide. By Enos A. Mills. Pub., Doubleday, Page & Co., New York. Donor, LeRoy Jeffers.

A series of essays, partly reprinted, partly new, by an author who knows well of what he is writing. A nature guide is described as a naturalist who can guide others to the secrets of nature, and in these days of crowded city life there is much need of such guidance. To those who have been brought up in the country and trained to see and understand, there is something pitiful about the absolute ignorance and blank mind of the city dweller. A paper which might have been elaborated with advantage on "Censored Natural History News" deals with the absurd beliefs and statements repeated again and again concerning the biological world by those who know themselves infallible. The point of the book may be expressed in one of its happy sentences. "A sunset is never an old story, and a coloured sunset above the white west line of winter's silent earth renews the imagination of youth."

It is refreshing to come across an author who knows sufficient of the history of the English tongue to spell "colour" with a "u."

Going Afoot. By Bayard H. Christy. Pub., Association Press, New York. Donor, LeRoy Jeffers.

Another book to rescue the unfortunate townsman from the abysmal ignorance in which he is plunged. The gospel of walking is a new one to the people of the United States in spite of Open Air Clubs. This book is most practical and sensible. So much of it is a matter of course to those who have walked all their lives that one appreciates the imagination of the author who can realize what will be problems to the beginner and not merely discoveries of the obvious. Most people who go on a long walking tour take a book as a standby to refer to again and again when in need of mental refreshment. The author suggests excellent fare—The Bible (few seem to realize what interesting adventures it contains. The story of David and the water from the well of Bethlehem would be praised as the height of romance in a modern book). The Golden Treasury and the Three Musketeers. Curiously enough, the classic book for the wayfarer is not mentioned—The Pilgrim's Progress. Huck Finn pronounced its incidents interesting if tough. There is an excellent section on Club Policy and much throughout the book which shows an appreciation of true values and right perspective.

On the Edge of the World. By Edmund Candler. Pub., Cassell & Co., London, etc. Donor, LeRoy Jeffers.

Reviewed on a previous page.

Useful Wild Plants of the United States and Canada. By C. F. Saunders. Pub., R. McBride & Co., New York. Donor, LeRoy Jeffers.

It is an old experience that no one is so tyrannical in his personal affairs and family relations as the extreme political radical. So democratic people refuse to learn of foreigners anything in the way of diet, however advantageous it may be. This book is written with the object of calling attention to the many economically useful plants on the North American continent, highly appreciated abroad but unknown at home. Among the more interesting chapters are "Beverage Plants" and "Vegetable Substitutes for Soap." The book is pleasantly written and the drawings of various plants are helpful. It is duly provided with both regional and nominal indexes.

Mountain Memories: A Pilgrimage of Romance. By Sir Martin Conway. Pub., Funk & Wagnalls Co., London and New York. Donor, LeRoy Jeffers.

Reviewed on a previous page.

The Playground of the Far East. By Rev. Walter Weston. Pub., John Murray, London. Donor, General C. H. Mitchell.

A delightful book by an acknowledged authority, dealing with the mountains of Japan from many points of view.